# Journal of the Society of Arts.

*FRIDAY, JANUARY* 30, 1863.


## SOCIETY'S MEMORIAL OF THE PRINCE CONSORT.

The Council hereby convene a General Meeting of the Members of this Society, to be held on Saturday, the 7th February, at 2 o'clock, p.m., to receive a Report from the Council in reference to the intended Memorial of the Prince Consort for the Society.

By Order of the Council,

P. LE NEVE FOSTER, Secretary.

*28th January*, 1863.

## NOTICE TO MEMBERS.

The following circular has been sent to each member of the Society:—

Society of Arts, Manufactures, and Commerce,
John-street, Adelphi, London, W.C., 30th January, 1863.

SIR,—In preparing the lists of members from which Committees of Reference are to be appointed by the Council, in conformity with the 36th bye-law, the Council desire to avail themselves. in the fullest and most useful manner, of the varied information and practical experience of all the members of the Society who may be willing to promote its objects by serving on such Committees.

To this end the Council propose to frame the lists under the nine general heads undermentioned; and they will be much obliged to you if you will inform me, on or before Monday, the 9th of February next, on which list, if any, you are willing that your name should be placed, and if you will specity any subject or subjects, in which you take a particular interest, capable of being properly included under the general head selected by you.

In the event of your not wishing your name to be placed on any of the lists, no reply is expected to this letter.

I am, Sir, your obedient servant,
P. LE NEVE FOSTER, Secretary.

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|---|---|
| I. Fine Art. | VI. Commerce. |
| II. Agriculture. | VII. Colonies. |
| III. Chemistry. | VIII. Education. |
| IV. Manufactures. | IX. Economic and Sanitary Science. |
| V. Mechanics and Engineering. | |

## EIGHTH ORDINARY MEETING.

WEDNESDAY, JANUARY 28, 1863.

The Eighth Ordinary Meeting of the One Hundred and Ninth Session was held on Wednesday, the 28th inst., W. R. Grove, Esq., Q.C., F.R.S., in the chair.

The following candidates were proposed for election as members of the Society:—

| | |
|---|---|
| Adley, Charles Coles..... | 49, Hereford-road North, N. |
| Beaumont, Joseph..... | 22, Parliament-street, S.W. |
| Mackenzie, John Henry... | 3, Dr. Johnson's-buildings, Temple, E.C. |
| Williams, John Wrigley. | 3, Bishopsgate-street Within, E.C. |

The following Candidates were balloted for and duly elected members of the Society:—

| | |
|---|---|
| Blanchard. Mark Henry. | 74, Blackfriars-road, S. |
| Burrell, Alexander ..... | Gresham Club, E.C. |
| Challis, J. H. ..... | 35, St. James's-place, S.W. |
| Combe, James ..... | (Jas. Combe and Co.), Belfast. |
| Duncan, Lieut. Francis, LL.D., &c. ..... | Woolwich, S.E. |
| Fordham, Thomas..... | 18, St. Mary's-ter., Westmoreland-place, Paddington, W. |
| Hoe, Richard March ..... | New York. |
| Livingstone, A. S. ..... | Adelaide-cottage, Carlton-road, Peckham, S.E. |
| Loveridge, Henry ..... | Wolverhampton. |
| Lückes, Henry Richards. | Ross, Herefordshire. |
| Myddleton, David..... | Burton, near Lincoln. |
| Nicole, Adolphe..... | 14, Soho-square, W. |
| Pairpoint, Thomas Francis ..... ..... | 7, Green-street, Leicester-square, W.C. |
| Ravaison, Walter ..... | 8, Richmond-buildings, Dean-street, Soho, W. |
| Robinson, John ..... | Atlas Works, Manchester. |
| Sawyer, The Rev. Walter John ..... ..... | Belle Vue House, near Ross, Herefordshire. |
| Stenson, Joseph ..... ... | Northampton. |
| Wadsworth, James ..... | 21, St. Symon's-street, Salford, Manchester. |

AND AS HONORARY CORRESPONDING MEMBER,

| | |
|---|---|
| Macchi, Mauro, M.P. ... | Turin. |

The Paper read was—

## THE SUBMARINE TELEGRAPH.

BY T. A. MASEY.

The remarks which I have to offer this evening are more of an historical character than a scientific treatise upon the subject, and are not intended to illustrate any new principle of electric science, or to advocate any particular cable or route, but simply to place before you what has already been accomplished, and to review the various projects put forth by the different persons interested, leaving it to them, and to the *savans* in the science, many of whom I see present, to tell you in a strictly scientific form their views on the subject.

The invention of the electric telegraph as it now exists belongs not to one individual, but is the joint production of many eminent scientific men at different periods, and of various countries. The following may specially be mentioned:—Watson, in England, 1747; Lesarge, at Geneva, 1774; Betancourt, in Spain, 1787; Sommering, in Germany, 1809; Dyer, in New York, 1820; Steinheil, in Bavaria, 1836; Sir Wm. O'Shaughnessy, in India, 1839; Cooke and Wheatstone, in England, 1837; Professor Jacobi, in Russia, 1842; Morse, in America, 1843, and Brett, in London, 1845.

But to England and Englishmen will ever belong the merit of its first practical use and development, and the names of Cooke, Wheatstone, and Brett, will ever stand out as landmarks in the history and progress of this wonderful invention as the men who gave the lightning voice, and bade it speak in every tongue its marvellous messages to the world. With the names of the two first gentlemen must ever be associated the merit of having practically introduced the science of land telegraphy, and with the name of the latter that of submarine.

Now that the submarine telegraph occupies such a prominent position before the world, many have claimed the honour of its invention, because they had been associated with it at an early date. Without wishing to detract from the merit of the labours of one individual, or to add to those of another, I may be permitted to state so far as it is known what each rival claimant did.

Professor Wheatstone, in 1840, prepared plans for a

submarine telegraph, which he either did not complete, or circumstances prevented him from making any practical use of them, at that time or since.

Professor Morse states that in 1842 he laid an insulated wire across from Castle Garden to Governor's Island in the harbour of New York, and demonstrated the practicability of submarine telegraphy. His experiments, however, went no further, beyond suggesting the probability that a telegraph across the Atlantic would be some day accomplished.

The theory and experiment were destined to be practically and successfully carried out by another. Mr. Brett, in 1845, took out a patent (the first on record) for the invention of a submarine electric cable, the insulating medium to be caoutchouc and other substances (gutta percha not having come into use for telegraph purposes) protected by a plaited hempen cord, similar to that which is being advocated by several persons at the present time.

It also appears on reference to the Government Joint Stock Registration Office, that in June, 1845, the Messrs. Brett registered a company "To form a connecting mode of communication, by telegraphic means, from the British Islands, and across the Atlantic Ocean to Nova Scotia and the Canadas, the colonies, and continental kingdoms."

At that early period the public had scarcely realised the mighty progress of steam and railway engineering science, and only looked upon the electric telegraph as a necessary appendage to the railway, and but dimly comprehended its method of action, or the vita necessity which it has since become to the capitalist, merchant, and *agent de change*.

Mr. Brett, however, worked on, but receiving no support or encouragement from the British Government, to whom he had applied for assistance, he turned his attention to France, and, in 1847, received from the government of Louis Philippe an exclusive grant to lay cables on the French coast for ten years, which was afterwards renewed by the Emperor of the French, and in August, 1850, together with other gentlemen associated with him, he laid the first experimental line across the Channel from Dover to Calais.

This cable was simply a gutta percha covered copper wire, and considering the manner it was laid, it is a wonder that it was at all successful. It was simply wound round a large drum, like a reel of cotton, placed upon the deck, and as it ran out large heavy lead weights were attached at various lengths to sink it, which contained in themselves the elements of destruction. But the fates were propitious, and everything went well, the cable was laid, landed, and spoke—words that must have thrilled through the hearts of the anxious projectors, proving that the idea was no mere idle vision of the brain, as some eminent engineers had stated it to be, but a reality. Greatly to the regret and disappointment of all interested, the cable broke during the night. However, success had been such that the promoters set to work, and a more durable cable, from the specification of Mr. J. W. Brett, was begun by Messrs. Wilkins and Wheatherly, and finished by Messrs. Newall and Co., but the length proving insufficient when laid, it was buoyed, and the additional length manufactured by Messrs. Kuper and Co., now the firm of Messrs. Glass, Elliott, and Co., so that three different manufacturers assisted in making the first permanent cable.

It was laid in August, 1851, and although it has several times been broken by ships' anchors, yet at the present time it works as well, and is in as good preservation, as on the day it was laid, and is an example of the durability of submarine lines, even with rough handling, when the materials are good, well constructed, and properly laid.

The success of this undertaking having proved everything that the promoters anticipated, other enterprises immediately followed. The Table on the next page gives full particulars of the various submarine cables.

It appears that 15,156½ miles of telegraphic cables have been laid. Some have proved most successful, while others have become total failures, and at the present moment there are only about 6,350½ miles at work. It will be seen that the average of lost cables is about one-third, if the Atlantic and Red Sea cables, which together make 5,761 miles, be taken away, on the principle that from the first they were totally unfitted for the work, and ought not to have been laid; the former from causes which I will hereafter explain, and the second, from the fact that if the most ordinary precautions, and the experience obtained by the Atlantic cable had been observed, the line might now have been in operation.

It is also worthy of note that out of the 6,350½ miles in perfect working order, upwards of 4,000 were manufactured by Messrs. Glass, Elliott, and Co.

It would occupy too much of your time this evening to discuss separately the causes which have occasioned the ruin of so many cables. I will, therefore, confine myself to the principal subject of the evening, the

### ATLANTIC TELEGRAPH.

It appears that from the year 1845, Mr. Brett continually solicited aid from the British Government towards an Atlantic line, but without success until 1856, when the government of Lord Palmerston granted a subsidy of £14,000, and the American Government gave a similar guarantee; each grant being still in force so long as a cable be laid down and continue in working order between Ireland and Newfoundland.

Previous to this date in 1851, Mr. F. N. Gisborne, an engineer, proposed the plan, which is now adopted, to shorten the communication between Europe and America, by making St. John's, Newfoundland, a port of call for Atlantic steamers, and constructing a telegraph from thence to join the American lines. His company, however, failed to carry out the undertaking, and was bought up by Mr. Brett, Mr. Cyrus W. Field, and other American gentlemen, who completed the communication to the American continent, and having obtained certain privileges from the legislature of that colony, and also the exclusive right to land cables, immediately turned their attention to the realization of a telegraph line across the Atlantic.

About this time, 1854, Prof. Faraday and Mr. Latimer Clark, made some experiments relative to an electrical phenomenon which had presented itself to the observation of persons working underground lines and submarine cables, viz., the difference in speed at which the fluid travelled along a wire covered with an insulating substance and laid in the sea or earth, and along a simple wire suspended by insulators attached to poles. This had been observed by Mr. Varley in 1848, and by Mr. Siemens in 1849.

It was observed in the case of the former that a resistance was offered to the flight of the fluid from induction. That is, when a wire is covered with an insulating substance, say gutta-percha or india-rubber, and surrounded by water, or laid in the earth, and a current of electricity is sent along the wire, the travelling electricity excites in its progress an electrical force of an opposite kind, which attracts and retards the current moving freely on its journey as it would do along an *aërial line*. It will be readily understood that the longer the cable the greater the resistance of the induction, and so greatly was this effect feared at that time, that it was said a cable of 2,500 miles could not be worked commercially.

The subject therefore had to be examined, and experiments made, to determine the law which governed the loss of speed, and the current's power to produce mechanical effects at the end of a lengthened journey.

Mr. Whitehouse, the late electrician of the Atlantic Company, at the request, and under an agreement with Mr. Brett, turned his attention to the subject, and made some valuable experiments upon a cable then being manufactured for the latter gentleman at Greenwich. The British and Irish Magnetic Company, who possessed long lengths of underground lines, placed them at this gentle-

## SUBMARINE CABLES.

| Date when laid. | From | To | No. of Conductors. | Size per Birmingham Wire Gauge. | Size of Gutta Percha per Birmingham Wire Gauge. | Outside Wires. No. | Outside Wires. Size. | Length of Cable in Statute Miles. | Length of Insulated Wire in Statute Miles. | Depth of Water in Fathoms. | By whom manufactured. | Length of time the Cables have been working. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1851 | Dover ... ... | Calais ... ... | 4 | 16 | 2 | 10 | 1 | 27 | 108 | ... | Wilkins & Wetherley, Newall and Co., Kuper and Co., and Mr. Crampton. | 11 years. |
| 1852 | Holyhead... ... | Houth ... ... | 1 | ... | ... | 12 | ... | 73 | 73 | ... | R. S. Newall. | ... ... |
| 1853 | Denmark, across the Belt... | ... ... ... | 3 | 18 | 4 | 9 | 2 | 18 | 54 | ... | R. S. Newall and Co. | 9 years. |
| 1853 | Dover ... ... | Ostend ... ... | 6 | 16 | 2 | 12 | 2 | 80½ | 483 | ... | Newall & Co., & Kuper & Co. | 9 years. |
| 1853 | Frith of Forth ... | ... ... .. | 4 | 16 | 1 | 10 | 8 | 5 | 20 | ... | R. S. Newall and Co. | 9 years. |
| 1853 | Portpatrick .. | Donaghadee ... | 6 | 16 | 2 | 4 cables | galvanized | 25 | 150 | ... | Ditto. | 9 years. |
| 1853 | England*... ... | Holland* ... | 1 | 16 | 1 | 12 | 2 | 480 | 480 | 30 | Ditto. | 9 years. |
| 1854 | Portpatrick ... | Whitehead ... | ... | 6 | ... | 10 | 8 galvanized | 27 | 162 | ... | Ditto. | ... ... |
| 1854 | Sweden ... ... | Denmark ... | 3 | 16 | No. 2 | .. | ... | 12 | 36 | 14 | Glass, Elliot, and Co. | 8 years. |
| 1854 | Holyhead... .. | Houth ... .. | ... | ... | ... | 10 | 2 | 73 | 73 | ... | R. S. Newall and Co. | 8 years. |
| 1854 | Italy ... ... | Corsica .. ... | 6 | 16 | 1 | ... | ... | 110 | 660 | 325 | Glass, Elliot, and Co. | 8 years. |
| 1854 | Corsica ... ... | Sardinia ... ... | 6 | 16 | 1 | 12 | 1 | 10 | 60 | 20 | Ditto. | 8 years. |
| 1855 | Varna ... ... | Constantinople .. | ... | ... | ... | 12 | 1 | 172 | 172 | ... | Newall. | 7 years. |
| 1855 | Varna ... .. | Balaklava ... | ... | ... | ... | ... | ... | 356 | 356 | ... | Ditto. | 7 years. |
| 1855 | Egypt ... ... | ... ... | 4 | 16 | 2 | 10 | 1 | 10 | 40 | ... | Glass, Elliot, and Co. | 7 years. |
| 1855 | Italy ... .. | Sicily .. ... | 3 | 16 | 2 | 10 | 1 | 5 | 5 | 27 | Ditto. | 7 years. |
| 1856 | Newfoundland ... | Cape Breton ... | 1 strand. | 14 | 1 | 12 | 9 | 85 | 85 | 360 | Ditto. | 6 years. |
| 1856 | Prince Edward's Island ... | New Brunswick. | 1 do. | 14 | 1 | 12 | 9 | 12 | 12 | 14 | Ditto. | 6 years. |
| 1857 | Norway ... across | Fiords ... .. | 1 do. | 14 | 1 | 10 | 6 | 49 | 49 | 300 | Ditto. | 5 years. |
| 1857 | Sardinia ... .. | Malta ... | | | | | | | | | | |
| 1857 | Malta ... ... | Corfu ... | | .. | ... | ... | ... | 700 | 700 | ... | Newall and Co. | ... ... |
| 1857 | Across mouths of | Danube ... ... | 1 do. | 14 | 1 | 12 | 9 | 3 | 3 | ... | Glass, Elliot, and Co. | 5 years. |
| 1857 | Ceylon ... ... | Mainland of India, &c. | 1 do. | 14 | ... | ... | 8 | 30 | 30 | ... | Ditto. | 5 years. |
| 1857 | Sardinia ... ... | Bona .. ... | 4 | ... | ... | ... | ... | 125 | 500 | ... | Newall and Co. | 3 years. |
| 1858 | Italy ... ... | Sicily ... ... | 1 | 16 | 2 | 10 | 1 | 8 | 8 | 60 | Glass, Elliot, and Co. | 4 years. |
| 1858 | Dardanelles ... | Scio and Candia. | ... | ... | ... | ... | ... | 514 | 514 | ... | ... ... | 4 years. |
| 1858 | England ... . | Holland ... ... | 4 | 13 | 0 | 10 | 00 | 140 | 560 | 30 | Glass, Elliot, and Co. | 4 years. |
| 1858 | Ditto ... ... | Hanover... ... | 2 strands. | 16 | 3 | 12 | 6½ | 280 | 560 | 30 | Ditto. | 4 years. |
| 1858 | Norway .. across | Fiords ... ... | 1 do. | 14 | 1 | 10 | 6 | 16 | 16 | 300 | Ditto. | 4 years. |
| 1858 | South Australia... | King's Island ... | 1 | 16 | 1 | 10 | 8 | 140 | 140 | 45 | W. T. Henley. | 4 years. |
| 1858 | Weymouth ... | Alderney ... | ... | ... | ... | ... | ... | 93 | 93 | ... | ... . . | 4 years. |
| 1858 | Ceylon ... ... | India ... ... | 1 | 14 | ... | 12 | 8 | 30 | 30 | 45 | W. T. Henley. | 4 years. |
| 1858 | Ireland ... ... | Newfoundland ... | ... | ... | ... | ... | ... | 2,222 | 2,222 | ... | Glass and Elliot, & Newall & Co. | ... ... |
| 1859 | Singapore... ... | Batavia ... ... | ... | ... | ... | ... | ... | 550 | 550 | ... | Newall and Co. | 3 years. |
| 1859 | Athens ... ... | Syra ... ... | ... | ... | ... | ... | ... | 117 | 117 | ... | ... ... | 3 years. |
| 1859 | Alexandria ... | ... ... ... | 4 | 16 | 3 | 10 | 1 | 2 | 8 | ... | Glass, Elliot, and Co. | 3 years. |
| 1859 | England ... ... | Denmark ... | 3 strands. | 16 | 3 | 12 | 5½ | 368 | 1,104 | 30 | Ditto. | 3 years. |
| 1859 | Sweden ... ... | Gotland ... ... | 1 do. | 14 | 1 | 12 | 9 | 64 | 64 | 80 | Ditto. | 3 years. |
| 1859 | Folkestone ... | Boulogne ... | 6 do. | 14 | 3 | 12 | 0 | 24 | 144 | 32 | Ditto. | 3 years. |
| 1859 | Across rivers ... | in India ... ... | 1 | 13 | 0 | 9 | 2 | 10 | 10 | ... | Ditto. | 3 years. |
| 1859 | Malta ... ... | Sicily ... ... | 1 strand. | 14 | 1 | 10 | 5½ | 60 | 60 | 79 | Ditto. | 3 years. |
| 1859 | England ... ... | Isle of Man ... | 1 | 16 | 2 | 10 | 6½ | 36 | 36 | 30 | Ditto. | 3 years. |
| 1859 | Jersey ... ... | Pirou in France. | 1 strand. | 14 | ... | 12 | 5½ | 21 | 21 | 15 | Ditto. | 2½ years. |
| 1859 | Tasmania ... | Bass Straits ... | 1 | 16 | 1 | 10 | 8 | 240 | 240 | ... | W. T. Henley. | 2½ years. |
| 1859 | Liverpool... ... | Holyhead ... | 2 | 16 | 3 | 12 | 6 | 25 | 50 | ... | Glass and Elliot. | 2½ years. |
| 1859 1860 | Suez ... ... | Kurrachee ... | 1 | ... | ... | ... | ... | 3,499 | 3,499 | ... | R. S. Newall and Co. | ... ... |
| 1860 | France ... ... | Algiers ... ... | 1 strand. | 14 | 0 | 10 | 14 † | 520 | 520 | 1,585 | Glass, Elliot, and Co. | 2 years. |
| 1860 | Corfu ... ... | Otranto ... ... | 1 do. | 14 | 0 | 10 | 5½ | 90 | 90 | 1,000 | Ditto. | 2 years. |
| 1860 | Denmark... ... | Great Belt (14 miles) (14 miles) | 6 3 | 16 | 1 1 | 12 10 | 1 | 28 | 126 | 18 | W. T. Henley. | 2 years. |
| 1860 | Dacca ... .. | Pegu ... ... | 1 | 13 | 0 | 18 | 14 | 116 | 116 | ... | Ditto. | 2 years. |
| 1860 | Barcelona ... | Mahon ... .. | 1 | 14 | 1 | 16 | 12½ | 180 | 180 | 1,400 | Ditto. | 2 years. |
| 1860 | Minorca ... ... | Majorca ... ... | 2 | 16 | 3 | 18 | 12 | 35 | 70 | 250 | Ditto. | 2 years. |
| 1860 | Iviza ... ... | Majorca ... ... | 2 strands. | 16 | 3 | 18 | 11½ | 74 | 148 | 500 | Ditto. | 2 years. |
| 1860 | St. Antonio ... | Iviza ... ... | 2 do. | 16 | 3 | 18 | 11½ | 76 | 152 | 450 | Ditto. | 2 years. |
| 1861 | Norway ... across | Fiords ... ... | 1 strand. | 14 | 1 | 10 | 6 | 16 | 16 | 300 | Glass, Elliot, and Co. | 1½ year. |
| 1861 | Toulon ... ... | Corsica .. ... | 1 do. | 14 | 0 | 10 | 14 † | 195 | 195 | 1,550 | Ditto. | 1½ year. |
| 1861 | Malta ... ... | Alexandria ... | 1 do. | 8 | ½ | 18 | 11 | 1,535 | 1,535 | 420 | Ditto. | 1 year. |
| 1861 | Newhaven ... | Dieppe ... .. | 6 | ... | ... | ... | ... | 62 | 372 | ... | ... ... | 1 year. |
| 1862 | Abermawr, Pembroke | Grenore, Wexford | 4 do. | 14 | 1 | 12 | 3 | 63 | 252 | 58 | Glass, Elliot, and Co. | 6 months. |
| 1862 | England ... ... | Holland ... ... | 4 do. | 13 | 0 | 10 | 00 | 130 | 520 | 30 | Ditto. | 2 months. |
| 1863 | Cape Carbalnara | Trapani ... . . | 1 | ... | 12 | 10 | ... | 200 | 200 | 200 | Ditto. | ... ... |
| 1863 | Persian Gulf ... | ... ... ... | ... | ... | ... | ... | ... | 20 | 20 | ... | Hall and Wells. | ... ... |
| | In Germany, Russia, &c. ... ... | | ... | ... | ... | ... | ... | 1,000 | 1,000 | ... | Felden & Guilleaume. | ... ... |
| | | | | | | | TOTAL ... ... | 15,176½ | 19549 | | | |

* Fourteen separate cables of 120 miles each
† Steel covered with hemp.

man's disposal, and experiments, at which I believe Sir Charles Bright assisted, were made, extending over some 2,000 miles of insulated underground lines.

The results then arrived at were sufficient to demonstrate, beyond a doubt, and have since been indisputably confirmed, that an Atlantic cable could be worked successfully and commercially, although not at the same high rate of speed as that effected on aërial lines.

These four gentlemen then associated together to carry out the undertaking. Mr. Brett as the originator; Mr. Cyrus W. Field, on the part of the American interests; and Messrs. Bright and Whitehouse, as possessing the scientific element.

The Atlantic Company was then formed, and the necessary capital raised in £1,000 shares. But so eager and anxious were all parties interested to carry out this great work, that not sufficient time or attention was given for proper experiments to be made as to the adaptability of the cable to its future resting place, and the work which it had to perform when there.

True it is that a few experiments were made at the works of Messrs. Brown, Lenox, and Co., upon several cables manufactured by Messrs. Glass, Elliott, and Co., as to their breaking strain, and two were selected from the number tried. One was ultimately adopted weighing 93 lbs. to the mile, with a breaking strain of 3 tons. The other, although possessing greater advantages in strength, being made of single steel wires wound spirally for the outside covering, was not accepted, because of the difficulty and delay there would have been in procuring that description of steel wire. Had this latter cable been adopted, it might have shared the fate of the other, for the breaking strain of the other was sufficient to ensure its being laid safely; but that was not where the defects arose, and had the very best form of cable been subjected to the unfair treatment of the Atlantic, it must have shared a like untimely fate.

The rapidity with which the cable was manufactured would be a marvel of human industry, were it not for the fact that that most careful and watchful supervision required in making the joints and other detailed operations could not be carried out so perfectly as it might otherwise have been, a misfortune which dimmed the lustre of the achievement.

The core was covered with three coatings of gutta-percha representing 7,500 miles of work. 335,000 miles of iron and copper wire were drawn out and spun into more than 47,500 miles of strand, and upwards of 300,000 miles of tarred hemp were saturated and spun round the core, and the whole was put together and woven into a cable in about the space of four months.

As the cable was made it was coiled into several tanks, and by an oversight, quite inexcusable, it was left exposed to the weather at Greenwich, and so seriously had the sun effected it at one time, that sixteen miles had to be cut out. The heat having softened the gutta-percha, the inside copper wire was found protruding and touching the outside iron, thereby destroying the insulation. Now, it is reasonable to suppose that if 16 miles was seriously damaged, a greater length was also injured in a less degree by the same cause, from the copper conducting wire being forced from the centre of the gutta-percha to within a small space of the outside, an imperfection which was not then discovered, but which may afterwards have contributed to accelerate the destruction of the cable.

The first attempt to lay the cable, in 1857, was unsuccessful, owing to breaking in the paying out machinery, which was found unfitted for the operation. It was then unshipped and coiled into tanks made for the purpose at Plymouth, to wait for another year. During the interval it was completely overhauled, and a great many defective places and joints cut out, and upwards of one hundred fresh splices made. Although this was bad enough, yet I believe another operation was performed upon it, that no doubt told a tale when the cable was submerged, which was pricking it every two or three miles for faults, that is, pushing a needle at short lengths through the gutta-percha to the copper wire to test it. Now, if this was done frequently, and the small aperture not carefully stopped up, which may not have been the case in every instance, the great pressure of the water would soon find out these small defects. Another great disadvantage connected with this cable was that owing to its being manufactured by two rival firms 200 miles apart, it was neither tested in one length during its manufacture, nor under water previous to being laid.

The next year the cable was a fourth time recoiled on board the *Niagara* and *Agamemnon*, together with an additional length, making up the total to 3,000 miles. The ships met in mid ocean, and the cable being spliced, one started for the American coast, and the other for the English, and, after three ineffectual attempts in that year, it was at last finally laid 5th August, 1858—laid, as everyone practically connected with the enterprise then knew—only as an experiment, for the injuries it had received were now patent to all, but the cable was made, and must be laid.

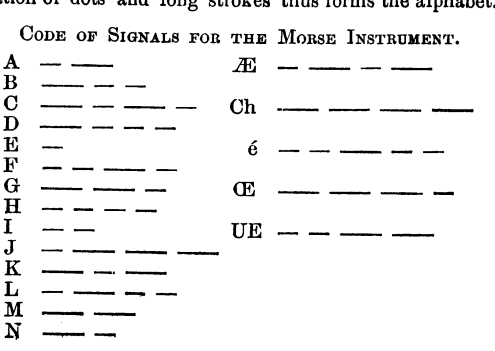
A very singular incident happened during the final laying. A series of preconcerted signals through the cable was kept up between the ships during the paying out, but a sudden cessation of these signals was on one occasion perceived, although the insulation was good, and after a time the currents came again as strong as before. This could only be accounted for on the supposition that the internal copper wire had broken from the strain, and that when the cable in which it was had reached the bottom, the two ends had been brought together again by the elasticity of the sheath. A serious fault of insulation also appeared in the cable at about 420 miles from the Irish coast.

From the 5th to the 10th August no messages were sent through the cable, owing to the necessary arrangements not being completed; from the 10th to the 17th no message beyond a few words could be either sent or received, owing to the weakness of the currents from leakage. On the 18th the signals got a little better, and constant communication was kept up, with more or less success, till the 2nd September, when it finally ceased to speak, after having transmitted

| MESSAGES. | | WORDS. | | LETTERS. | |
|---|---|---|---|---|---|
| 97 | containing | 1,102 | containing | 6,476 | from Valentia to Newfoundland |
| 269 | ,, | 2,840 | ,, | 13,743 | from Newfoundland to Valentia. |
| 366 | ,, | 3,942 | ,, | 20,219 | Total. |

The receiving instruments prepared to work the cable were upon the principle of that of Professor Morse, which is now universally adopted wherever there is a telegraph. Its construction is most simple. The electricity transmitted acts upon an electro-magnet, which is drawn down, whilst a long armature connected to it rises against a piece of travelling paper, making it touch an ink roller above, every time a current of electricity arrives, so that a series of long or short dashes is recorded, according as the current of electricity is kept on for a short or long period. The combination of dots and long strokes thus forms the alphabet.

CODE OF SIGNALS FOR THE MORSE INSTRUMENT.



| | | | |
|---|---|---|---|
| O | — — — | 1 | — — — — — |
| P | — — — — | 2 | — — — — — |
| Q | — — — — | 3 | — — — — — |
| R | — — — | 4 | — — — — — |
| S | — — — | 5 | — — — — — |
| T | — | 6 | — — — — — |
| U | — — — | 7 | — — — — — |
| V | — — — — | 8 | — — — — — |
| W | — — — | 9 | — — — — — |
| X | — — — — | 10 | — — — — — |
| Y | — — — — | | |
| Z | — — — — | | |

Now, in the case of the Atlantic cable, the amount of electricity which arrived was much too weak to move this armature, and had it not been for Professor Thomson's marine galvanometer, in all probability no message whatever would have been deciphered. This instrument is as ingenious as it is simple, and I will first explain the construction of it, and then the manner of reading off the messages from it.

Round a small brass tube is wound a quantity of the finest copper wire, and suspended in this tube by a silken thread is a little mirror, about the size of a sixpence, with a magnet at the back; upon this mirror a light is thrown from a lamp, which is reflected back by the mirror upon a scale, showing a little spot of light. The apparatus is so simple and sensitive that the slightest current of electricity is sufficient to act upon the magnet attached to the mirror, and cause it to move either to the right or left, according to the nature of the fluid, whether negative or positive. Of course it is necessary to use this instrument in a dark room. In the case of the Atlantic cable, when this instrument was used, a Morse instrument was fitted up on short circuit, that is, only working in the room, totally unconnected with the cable, and whenever the clerk saw the spot of light move on the scale, he immediately pressed down the Morse key, and so made a mark; but when the light vanished he took his hand off until it appeared again, so that he obtained by this means a series of dashes and blanks, according to the Morse alphabet, and that was the ingenious way that the messages were received and decyphered through the Atlantic cable.

On the 1st December, 1859, a Government Committee was appointed by the Board of Trade, at a cost of some £20,000, to inquire into the cause of failure. This Committee, consisting of Captain Galton, Prof. Wheatstone, Mr. W. Fairbairn, Mr. G. P. Bidder, and, on the part of the Atlantic Company, Messrs. E. Clark, Varley, Latimer Clark, and Saward, thoroughly sifted the whole subject, every person who could give any information being examined and the result of their labours is to be found in a Blue Book of more than ordinary dimensions. They state that "the failure of the enterprise was to be attributed to the original design of the cable having been faulty, owing to the absence of experimental data; to the manufacture having been conducted without proper supervision, and to the cable not having been handled after manufacture with sufficient care. We desire, however, to observe that we are clearly of opinion that the failures of the existing submarine lines have been due to causes which might have been guarded against had adequate preliminary investigation been made into the question, and we are convinced that if regard be had to the principles we have enunciated, in devising, manufacturing, laying, and maintaining submarine cables, this class of enterprise may prove as successful as it has hitherto been disastrous."

Attempts to recover any lengths of the Atlantic cable failed owing to the lapse of time before they were made. However, one or two interesting facts came to light; one, that off Newfoundland the cable had been lying upon rocks, and had been chafed very much. Another, and a very important discovery was also made, namely, that wherever the outside covering had been protected by a serving of yarn, the wires were perfectly preserved and quite bright, whilst on a continuation of the same piece a few inches further and uncovered, the wire had corroded down to the thickness of a needle. It was also observed that the cable had been lying on a bed of copper ore, as a coating of that metal had attached itself to the cable.

With regard to the first of these discoveries, a fresh survey of the coast has been made by the United States Government, under the direction of Capt. Orlebor, and a more suitable locality has been decided upon for the next cable, that pointed out by Captain Kell, in 1859, in Trinity Bay, New Pelican Harbour, the bottom of which consists solely of soft mud.

As to the second, it is now acknowledged by all connected with the science, that the outside wires should be protected from corrosion by hemp, and other substances. Messrs. Glass, Elliott, and Co., propose a covering like the specimen on the table.

Since the Atlantic cable was made, the Gutta Percha Co., have greatly improved the manufacture of this important article, and Mr. Varley gives it as his opinion that the insulation of the wires as now manufactured is ten times better than that made in 1857.

Great care is also now bestowed on testing and selecting the copper wire, as it is found that the quality of the copper exercises an important influence on the conducting power of the wire, in some instances a difference of from 30 to 50 per cent.

Another great improvement has been adopted by testing the gutta percha covered wire under pressure according to the depth of water where it will have to be submerged. For instance, if a cable is to descend one mile into the sea, the pressure will be about 2,500 lbs. to the square inch. If two miles, 5,000 lbs., and so on, up to 10,000 lbs. to the square inch. The importance of this fact cannot be too strongly enforced, as any defect arising from air bubbles, or the smallest aperture like a pin's point, would be immediately detected.

The invention is that of Mr. Reid, consisting of a large cast iron cylinder, with a moveable cover to allow the coils of wire to be placed therein. The cover is bolted down and made perfectly air tight. The cylinder is exhausted of air, a vacuum being formed by means of an air pump; the stop cock to the air pump is then shut, and water is pumped in up to the force required—20,000 lbs. to the square inch, if necessary. One end of the wire is conducted from the interior through a stuffing box to the outside, and attached to the testing instrument; the other end of the wire is insulated, the object being to keep the wire charged full of electricity, so that it may try to force itself out while the pressure is applied, and if the wire is not perfectly insulated and the slightest particle of electricity escapes, it is immediately detected.

The practical working of submarine cables has also undergone a change; instead of a large quantity of electricity being transmitted at one time to overcome the resistance of the wire, the wave now communicated is as small and as weak as possible, so as not to wear out the cable unnecessarily. The practice of the science has also demonstrated that positive currents of electricity, or those generated from the copper pole of the battery, are better adapted to the working of submarine cables than the use of the negative currents, or those from the zinc pole of the battery, or both alternately, which, it has been observed, will soon find out the weak and defective places, and destroy the cables at those particular parts. It was this that, in a measure, accelerated the fatal pause in the Atlantic cable, as every current sent along it literally only made matters worse by increasing the injuries which the cable had received previous to its submersion.

A great improvement has also been made in the construction of very delicate instruments for use on long submarine lines, and I am informed by Mr. Varley, that he confidently anticipates working through the next Atlantic cable at the rate of 12 to 16 words per minute.

I will now draw your attention to the five proposed telegraphic routes to America. That from Ireland to

Newfoundland (a distance of about 1,950 miles) having been found practicable, I will take it first.

In 1857, soundings were made by H.M.S. *Cyclops* under Lieut. Commander Dayman, and by the U.S.S. *Arctic*, commanded by Lieut. Berryman, which tended to show that there is a sudden descent about 180 miles off the coast of Ireland, of from 550 fathoms deep to 1,750 fathoms, and at this point it was considered by many that the cable received an injury from its being laid too taut. Orders were given on board, that when approaching this spot a good deal of slack was to be paid out, so that the cable might lay flat, and not be strained or suspended upon any ridge. This direction, however, was not sufficiently attended to, as the spot was passed during the night, and was not observed until the diminished strain upon the cable indicated shallow water.

Further soundings in H.M.S. *Porcupine*, in June, July, and August, last year, by Captain Hoskins, were made, with a view to find a more gradual slope into the bed of the ocean, and it is most satisfactory to report that by going more to the west, between Bantry and Blacksod Bay, a descent into the ocean is formed, varying from 6 to 19 feet dip in 100 feet horizontal.

Soundings have also been made by the American Government off the coast of Newfoundland, by Captain Orlebor, and a channel is found to exist from the approach to Trinity Bay to a place called New Pelican, where there exists every facility for landing, &c., and by adopting this terminus upwards of 50 miles of cable will be saved.

The results of these soundings, and the great progress generally effected in all branches of the science of telegraphy, as well as the consideration of an offer made to the company by the eminent cable manufacturers, Messrs. Glass, Elliott, and Co., that if they were selected to manufacture and lay the cable, they will undertake to keep it in working order for one year, and not only take shares for the amount of their profit, but also pay cash to the extent of £25,000 for shares, have induced the directors again to come forward and solicit public support for a new cable, which appeal I am happy to state is being responded to in a most liberal and encouraging manner.

The Company have most wisely appointed a Scientific Consulting Committee, consisting of Mr. Fairbairn, Mr. Joseph Whitworth, Prof. Wheatstone, and Prof. Thomson, in whose hands the selection of a suitable cable, and other matters of scientific interest appertaining thereto, may very properly be left.

It has been remarked that, although the Atlantic Company have appointed a Committee of great engineering and scientific ability to assist in determining the selection of a cable, yet a similar Committee of nautical gentlemen might also have been invited to assist at their councils. This, I apprehend, will be the case when the time arrives for active measures to be taken, the fact being, I have no doubt, that the Atlantic Company felt a difficulty in selecting a few out of the very large number of eminent and distinguished officers in H.M. navy.

The next route is the northern one, *vid* Scotland, Faroe Islands, Iceland and Greenland (a distance of about 1,700 miles.) It appears that in 1854 Colonel Shaffner traced out a route and obtained a concession from the King of Denmark for permission to land a cable upon his territories. Nothing was, however, done beyond this till 1859, when Colonel Shaffner having chartered the barque *Wyman*, made a personal survey of the route. His survey was such that Her Majesty's Government was memorialised to have soundings made, and in June, 1860, Her Majesty's ship *Bulldog*, commanded by Sir Leopold McClintock, started to survey the deep seas for the proposed telegraph. He reported that from Scotland to the Faroe Islands the depths did not exceed 254 fathoms; from thence to Iceland the maximum depth was 683 fathoms; from Iceland to Greenland it was 1,200 fathoms; Greenland to Labrador 2,000 fathoms, whilst the bottom throughout appeared to be of fine sand and soft mud.

As Sir Leopold McClintock's instructions had reference only to the deep sea soundings, a second expedition was fitted out, and this time at the cost of the promoters, to survey the different coasts, and to obtain all other necessary information. This expedition started in the celebrated steam yacht *Fox*, under the command of Captain Young. Still, however, it appears neither of the expeditions entered upon any very detailed survey, owing to the weather, and another must undoubtedly be carried out before a cable could be laid.

The promoters of this route have advanced many arguments, upon the ground of short lengths of cable, in its favour, and against the adoption of the old route from Ireland from the causes of induction, but they say nothing themselves about overcoming the difficulty which the magnetic currents of the earth will occasion to the working of their cables. Yet this, in the opinion of those well versed in the science, is likely to prove in the land of the *aurora borealis* a very formidable obstacle, independently of the danger from icebergs and the difficulty of repairing at all seasons any accident to the cable. Still, notwithstanding these difficulties, with the wonderful inventions which are every day being perfected, I believe that at some future and no distant time a cable may be laid by this route.

I now come to the Spanish or South Atlantic route (a distance of upwards of 2,000 miles), to which that Government has promised a large subsidy upon the capital required, so soon as the cable is laid. It starts from Cape St. Vincent to Madeira, thence to the Canary Islands, Cape de Verd Islands, then across the Atlantic to the Island of St. Paul's, to Cape St. Roque. This is another route advocated upon the ground of short length, the longest section being about 900 miles. This line has not been specially surveyed for the purpose, but from the soundings laid down in Lieutenant Maury's chart, it appears that the only deep water to be found along the whole route is that near the Island of St. Paul's, which gives a depth of 3 miles. Still, if a survey was made, it is not unreasonable to anticipate that by going either to the north or south a less deep descent might be found; but another obstacle presents itself, and that is, the heat of the Gulf Stream, which will pass over the cable, and may affect the gutta percha. This, however, is only a supposition, and I hope it will not prove correct, and that no insuperable barrier may exist to the successful working of this line also.

I now come to another route, which proposes to start from the coast of France, probably Brest, to the Azores, thence to the Island of Bermuda, to Cape St. Hatteras, which would make a distance of 3,000 miles. This route has not been especially surveyed for this object, and the scheme is thought by some to be perfectly impracticable; first, owing to the great distance and depth (soundings to 7,000 fathoms having been made with "no bottom"); secondly, from the fact that the Azores are volcanic, so that it would be dangerous to lay a cable in their immediate neighbourhood, as a few years since an island disappeared altogether.

This project, however, as I was recently informed, on credible authority, has been abandoned in favour of a direct line from France to the Island of St. Pierre, which belongs to France, and lies off the coast of Newfoundland. I am also given to understand that the Emperor of the French has so far patronised this latter plan, as to promise a considerable subsidy annually upon the capital required for its accomplishment. Already, indeed, active measures have been adopted to form a company and to commence operations forthwith. It is calculated that this direct line would not exceed 2,000 miles in length.

With regard to the practicability of this project, as, indeed, of any other, I would quote some remarks of Lieut. Maury, in his work on the physical geography of the sea, which apply universally. He says:—

"I have no doubt whatever as to the ultimate success of a telegraph across the Atlantic. Indeed, the only

limit to our power to establish, at pleasure, lines of submarine telegraph, is the limit, if any, which nature herself may have interposed upon the galvanic current.

"The sea offers no obstruction on account of its depths or its currents to lines of any length. A line with an unbroken conducting wire across the Atlantic or Pacific is as practicable as one across the Alps or Andes.

"The real question for future projectors of lines of submarine telegraphs is not how deep, or how boisterous, or how wide the sea is, but what are the electrical limits to the length of submarine lines."

I will also call your attention to a remark by the same great authority relative to the pressure of the ocean upon a cable. He says, at page 343, "the pressure on the telegraph plateau between Newfoundland and Ireland varies from 200 to 300 atmospheres, that is, from 430,000 to 650,000 pounds to the square foot. Chemical forces may be measured and consequently overcome by pressure, for the gases generated by chemical decomposition are themselves capable of exerting in the process of that decomposition only so much pressure, but if we subject them to a greater pressure they cannot separate, and decomposition cannot take place."

In proof of this I refer to a recent discovery of Ehrenberg. In the specimens obtained at a great depth from the Mediterranean, that celebrated microscopist has distinctly recognised fresh water shells with flesh in them, from which interesting fact we may infer that the very volatile gases which enter into composition for the formation of the fleshy parts of marine animalculæ are subjected to such a pressure upon the bed of the ocean that they cannot separate. If this inference be correct, and it doubtless is, may we not proceed a step further, and conclude with reason, that with the pressure of the deep sea upon it, the gutta percha used for insulating submarine wires becomes "impervious to decay." This remark has been fully borne out by experience, as it is found that gutta percha, under pressure, greatly improves in condition, and has never been known to show the slightest symptoms of decay under water.

I now come to the consideration of the fifth and last route to America, which may be termed the overland route, and of which upwards of 5,000 miles have already been completed through Russia and Siberia, *via* Ormsk, the Ural Mountains, to Irkutsk, whilst next year the line will be completed to Nikolaevske and the Amoor, giving a telegraphic communication from Japan to Europe.

From Nikolaevske a submarine cable would be laid to Kamtschatka, then from Petropaulovsk to the several Aleutic Islands, 12 in number, thence extended a distance of about 1,900 miles to the Peninsula of Aliaska, from whence a land line would be continued to California, to which point the line is now open from New York.

On looking at the map at first sight, a shorter submarine route would be found across the Behring Straits, a distance of only 50 miles, but the impracticability of carrying out such a line arises from the nature of the countries around Behring Straits and the North-Western part of America, through which the aërial lines would have to be constructed. They are so wild, and so covered with perpetual snow and ice, that even the maintenance as well as the construction would be impossible, quite independent of the magnetic influence which affects the line. It is therefore proposed to carry the line *via* Kamtschatka and the Aleutic Islands, but when this will be accomplished it is impossible to say; still the Russian Government is pushing on their works, and next year they may have reached Irkutsk.

I have now briefly reviewed the subject, but I have a few words to say about the proposed cables, and telegraphing to America or elsewhere without the aid of wires at all. Hundreds of patents have been taken out for different kinds of cables, but the original spiral form of twisted wires for the outer covering, first adopted by Mr. Brett, still keeps its ground. It is impossible to say what form of cable will be adopted for the new Atlantic line; but no doubt every experiment and trial will be carefully made, and no expense spared to arrive at a satisfactory result; and when a suitable cable has been decided upon, and a careful supervision given to its manufacture, there can be no doubt that it will be successfully laid. Amongst other new inventions is that of Mr. Duncan's Ratan Cable, which he advocates upon the grounds of its flexibility without elasticity, of its being imperishable in water, and of the cheapness at which it can be manufactured.

Another form of cable, containing some new combinations, has been adopted by the Indian Government for their cable of 800 miles down the Persian Gulf. The novelty which it possesses is in the manufacture of the copper wire, which is a single wire instead of a strand of several, so much advocated, as affording great additional strength, and avoiding the possibility of a total fracture at one particular spot. But a strand has this disadvantage—that if one wire breaks, the sharp points are liable to start out and pierce through the gutta-percha. Want of solidity is also urged against a strand, as it is alleged that if water penetrate in any place to the wire it will pass along the wire as in a tube. To remedy this defect, the Gutta-percha Company propose to coat the central wire of the strand with Chatterton's compound, and bed the wire in it during the process of twisting.

Mr. Daft proposes to obtain the same object by bedding copper wires coated with brass in vulcanised india-rubber.

Mr. Varley proposes using three or more insulated wires joined together at different distances. If any one wire (or two wires) be exposed by injury to the water, the current will eat it away, and thus increase the resistance of the escape without increasing sensibly the line,—the more the wire is eaten away the better the cable becomes. Such a cable may be defective in 20 places, and yet work perfectly.

Mr. Newall unites the several wires of a strand with solder.

Mr. Latimer Clark, who, with Sir Charles Bright, are appointed engineers of the Indian Government, proposes to obtain this solidity by making the conductor in the shape of a solid wire, divided into three or four sections, longitudinally fitted, and rolled into each other, and they have adopted this form in the Persian Gulf cable now being manufactured by Mr. W. T. Henley.

The outside covering of iron wire is the old form, but it also is now coated with hemp, and a tarry composition to protect the iron from rusting, a plan which will be universally adopted in future after the experience gained with the Atlantic and Red Sea lines.

But while various parties have been at work devising new cables, another gentleman, a Mr. Haworth, has been at work to discover a means of conveying electric signals without any wires at all. He has taken out a patent and filed drawings of the apparatus, but I have not met one single gentleman connected with the science of telegraphy who could understand his process of action, or its probability of success, although the theory is an old one. I applied to him for some information relative to his experiments, but he is unwilling to communicate any particulars until the success of his plans has sufficiently demonstrated their practicability.

With respect to the comparative merits of gutta-percha and india-rubber I may remark that one of the earliest substances used for insulating purposes was india-rubber, but owing to the difficulty of efficiently covering the wire, and from the oxidation which took place when it was exposed to the atmosphere, it fell into disuse after the introduction of gutta-percha, and although universally admitted to contain insulating properties far above any other substance, no attempts, I believe, were made for several years to perfect it for telegraphic purposes.

Messrs. Silver have, however, in the last few years, turned their attention to the subject, and have been re-

warded by producing a substance called ebonite, which is being universally used for various insulating purposes.

They have also arrived at a perfection not hitherto obtained in covering wire. A mile length prepared by the Messrs. Silver was submitted to the Government Scientific Committee, and reported on by them as containing the highest insulation ever attained.

They state in the report, "That india-rubber surpasses all other materials in the smallness of the amount of its inductive discharge, and the perfectness of its insulation." Although this testimony carries great weight, yet the substance itself has not hitherto proved very durable, nor has it been adopted to any great extent, but the manufacturers are sanguine enough to believe that with the present and other improvements which may be made, it will one day surpass everything else.

As regards gutta-percha, no vegetable substance has yet been discovered which presents the same advantages to the electrician as this gum. Its many valuable properties are too well known to mention; suffice it to say that it has never been known to decay under water, and, as far as experience goes, it may in that case be said to be indestructible when suitably protected. The manufacture of the article has now arrived at a perfection to leave nothing to be desired but that the supply may not fail.

At a recent repairing operation in the case of the Belgian cable (made by Mr. France, the Submarine Company's engineer), and which was broken by a ship's anchor, it was found that, although the large iron wires of the outer covering were broken, as well as the internal copper conductor, yet so tenacious was the gutta-percha, that it resisted the enormous strain, allowing itself to be literally drawn out from the thickness of a piece of macaroni to an attenuated shred of vermicelli, thus adding another fact to those already established of its indestructibility under water, and its superiority over all other insulating materials for sub-marine cables.

The Submarine Telegraph Company liberally offered the use of their wires to connect the Society's rooms this evening with all the capitals of Europe, but upon applying to the engineer to make the necessary arrangements, it was found impracticable, without great difficulty and expense, owing to the wires of the Company being laid under the roadway in the Strand.

I regret this very much, as I had anticipated repeating an experiment which I witnessed some time since, namely, that of sending a telegram over the longest distance of land, and through the greatest extent of sea that was then possible. The experiment was so wonderful and interesting that it will bear relating, as showing what can be accomplished by the aid of electricity, although it does not refer immediately to the Atlantic cable.

A continuous wire was joined up from London to the island of Corfu, a distance of nearly 2,000 miles, but as the wire had necessarily to be suspended from hundreds of poles, extending over such a great distance, and where perhaps at every connection a small amount of electric fluid would escape, the charge would not last out to reach its destination without some additional assistance on the road. It therefore becomes necessary in such operations to refresh and invigorate the lightning, as in the old slow time a man would water his horses on the road, or as the Brighton "Age" would, in its then wonderful journeys, "change horses in half a minute."

To provide this assistance, instruments called "relays" were placed at different intervals along the line, the object of which was to receive the nearly exhausted current of electricity, revive it instantaneously with additional strength, and send it on to the next relay, and so on till it arrived at its destination.

In order to fully realise this wonderful achievement, we will trace the progress of a message along the route from London to Corfu.

The transmitting instrument in connection with the battery generating the electricity is set in motion. A flash of electricity is liberated, and wings it way along an insulated wire, under the busy streets of London, and under the now quiet turnpike roads to Dover, then under the surging waves through the submarine cable, peacefully lying at the bottom of the Channel, to Calais, were it mounts up to land again, traverses the intermediate country to Paris, picks up a relay of electricity charged from a local battery in waiting to revive its now languishing strength; and, reinvigorated, pursues its silent and instantaneous flight through cities and towns without stopping, but every now and then receiving assistance and new life, till it arrives at Turin; thence on to Genoa, from whence with increased power it dashes through the submarine cable, 100 miles in length, to Corsica, rushes over this island in the quickness of a thought, descends again into the sea, across the Straits of Bonifacio to Sardinia, up on land again, through villages, and over the Gallura Mountains, where the deadly malaria fever lurks, that killed so many men in its construction, to the eastermost point of this island; then again taking a header through another submarine cable lying at the bottom of the deepest part of the Mediterranean to Malta, over its rocky ridges to the other side, from whence it finally flashes through another submarine cable under the sea to its destination, Corfu, doing the whole distance of 2,000 miles in two seconds and-a-half, and passing over, in its transit, some of the highest mountains in Europe, as well as five times descending more than a mile's depth into the ocean.

But the coming back of this mysterious agent is still more wonderful than its guided transit along the wire; for there it has an operator, philosopher, guide, and friend to direct its course; but now it returns home again, not along a conductor supplied by a man's ingenuity, but alone through the earth. "The world is all before it where to choose," for after it has reached its destination and recorded its symbolic mission, it is transmitted down a wire, sunk in the earth for that purpose, to find its mysterious way back to the spot from whence it started, and passes up another wire similarly placed in the ground, again into the presence and power of the operator; for, until it has arrived at home, the electric circuit is not completed and no signal is given.

Wave after wave of electricity was transmitted, until the whole message of some twenty words had been communicated to the island of Corfu, the transit of the whole occupying three minutes; then a brief interval, and click, click, the serpentine length of paper unwinds itself, containing the reply, which came back in even less time than the message sent.

Having now briefly reviewed the subject of submarine telegraphs generally, and the Atlantic in particular, with some, I trust, pardonable digressions, I shall proceed to sum up my conclusions in as few words as possible.

1. First, then, with respect to the original cable, I cordially acquiesce in the resolutions arrived at by the Committee appointed by the Board of Trade, that "the failure of the enterprise was to be attributed to the original design of the cable having been faulty, owing to the absence of experimental data; to the manufacture having been conducted without supervision; and to the cable not having been handled, after manufacture, with sufficient care."

2. That intercommunication between the Old and the New World, by means of an Atlantic telegraph, is not more desirable than feasible.

3. That the accidents which befel the first cable arose from causes which there is every reason to believe will not occur again.

4. That the improvements in the process of manufacture of the cable itself, as well as of the insulating medium, have greatly enhanced the value of both, and in the latter case to an extent of 10 to 1, as compared with the insulating medium of 1857.

5. That we are no longer exposed to the mercy of the

elements in the matter of laying and paying out the cable, as on the previous occasion, the *Great Eastern* having obviated the serious danger and difficulties hitherto experienced from the pitching of vessels employed in these operations, and by which, through the strain upon the cable, success was rendered highly problematical.

6. That the above conclusions are borne out by the liberal proposals of those eminent and successful cable manufacturers, Messrs. Glass, Elliott, and Co., to which I have before alluded.

7. That recent experiments fully demonstrate the possibility of working a one-wire cable commercially; but that it will be cheaper in the end for the Atlantic Company to lay a cable consisting of at least two if not three wires, because there will be such an influx of messages both ways, that, if a one-wire cable only is laid, telegrams will have to wait two or three days before they can be sent. The chances of success would also be greatly enhanced by having more than one wire.

8. That of all the various routes contemplated, that between Ireland and Newfoundland presents advantages superior to any other.

9. That considering the issues at stake, the present state of the science of telegraphy, and the fact that it has already interfered to point out the causes of the former failure, and the remedies to be adopted in any subsequent undertaking, Government might reasonably be called. upon for another grant, at all events, to perfect the experiments necessary in a second and successful attempt to lay down the Atlantic Telegraph.

10. That the time has fully come when that attempt should be prosecuted in the interests not only of science, commerce, and social economy, but also from a regard to the still higher interests of civilization and humanity.

In conclusion, I indulge a fervent hope that those who have sacrificed so much already, and who, nevertheless, are prepared to risk still more to carry out this great work, may in the end reap the full reward of all their noble enterprize. Should, however, that pecuniary reward be wanting, of this I am well assured, that the consciousness of being pioneers on the high road to peace and amity among the nations of the earth, and above all, between the different families of the great Anglo-Saxon race, will be to them a source of satisfaction, alike deep and permanent. I shall only add the expression of a wish, in which I am certain all here will join, that our kindred across the Atlantic, diverted from scenes of fratricidal strife and bloodshed, may ere long turn their thoughts back again to such subjects as I have been discussing this evening.

## DISCUSSION.

The CHAIRMAN said it was now his duty to invite discussion upon the very interesting historical account of the Submarine Telegraph with which they had been favoured this evening. He was old enough to recollect the time when not only submarine telegraphs, but electric-telegraphy itself was a matter of doubt, when grave reasons were advanced which appeared very plausible at the time against the electric telegraph being in any sense practicable. The difficulties of insulation, the resistance of long lengths of wires, and the difficulty of obtaining an insulating medium which would not only resist the effects of time, but also the liability to fracture, seemed to render it problematic whether they should ever succeed with the electric telegraph at all. They were, however, now so accustomed to this mode of communication, that they had long ceased to think of the difficulties which attended its first introduction, and they were now extending their lines further and further till they had not only established the electric telegraph as a means of land communication over an enormous network of territory (and up to this time he had imagined it had been carried to a greater extent than the 6,300 miles mentioned in the paper, although this was a considerable distance, looking at the comparative short period during which the system had been in existance), but they had also very long distances of submarine telegraphs; and they had practically established the fact that it was possible to communicate signals across the Atlantic, a distance of about 2,000 miles. If they could effect the successful laying of the cable, there was nothing to prevent the communication of signals through that length of submarine wire. The difficulty had now become comparatively small, for as soon as it was known that the result could be effected, the rendering of that result of a more permanent character was only a work of time. There were two questions which appeared to be the principal ones opened for discussion by the paper: one was the best practical route to be adopted. Mr. Masey had expressed an opinion in *favour of* the direct route from Valentia to Newfoundland. There were many other persons who considered the route by Iceland and Greenland presented advantages over that from the coast of Ireland to Newfoundland. With regard to the Iceland route, objections had been mentioned in the paper respecting the magnetic influences which might be exercised upon the telegraph by the aurora borealis in those regions; but it had not been explained why those influences should exist to a greater extent in the Iceland route than in the other. It was true that the aurora borealis was supposed to have increased effect the nearer they approached the poles, but at the same time the difference of latitude between London and Iceland was so small that they could hardly suppose that the influences of those currents would have any greatly increased effect. He did not know whether experiments had been made on a sufficiently large scale to prove that that phenomenon exercised the effects upon the wire which were ascribed to it, and he was quite sure many gentleman present would be glad to receive some further information on that subject. If it should be found that the fears on this head were groundless, by the adoption of the Iceland route the line would be divided into three great divisions, so that if an accident occurred they would have only one-third of the line to deal with. Another subject which had occupied the attention of all electricians was the means of insulating and protecting the conducting wire. Had it not been for the discovery of gutta-percha, they would now be a good way off the point of perfection at which they had at present arrived in electric telegraphs. Gutta-percha had been proved to be a good insulator; it was elastic, but not to too great an extent, and was capable of sustaining the influences of time and exposure under water without injury, and would bear a great amount of pressure without cracking like glass or pitch, and it was, upon the whole, a very appropriate medium of insulation. It seemed to have come just in time to enable us to carry out those discoveries which had been made in submarine telegraphy. In addition to this, they had a second element of consideration, viz., the means of protecting the insulated core of the cable by an outer covering of iron wire or other material to preserve it from injury after it had been submerged. The larger the amount of information that could be gained on these subjects the better, seeing that another atttempt would, in all probability, be made ere long to carry a cable across the Atlantic, and he hoped this discussion would result in information of a valuable and practical character being imparted on these highly important subjects.

Rear-Admiral ELLIOTT would not have ventured to address the meeting on this subject were it not that he considered it to consist of two distinct elements, the scientific element and the practical element; and upon the latter, which had reference to the laying of the cable after it was completed, he thought he might be allowed to form some opinion. He had heard with the greatest pleasure the very able paper which had been read that evening, but there were one or two points on which he differed from Mr. Masey, and it was but fair that he should express them at once. There was one point which he thought had been omitted altogether. With regard to the failure in the laying down of the Atlantic cable different

reasons had been assigned; but he thought the practical reason of this failure was that the weight of the cable was so great, that if the cable itself had been perfect in a scientific point of view, in a practical point of view it would have been destroyed by its own weight, and he thought if the cable before them (a thick one) was that which it was proposed to lay down on a future occasion, he feared that its own weight would destroy it. He would not say one word in disparagement of the Atlantic Telegraph Company; on the contrary, he thought they were deserving of all honour as pioneers in this undertaking, and their persevering efforts to repeat the experiment after the misfortune that befel them deserved the greatest credit; but there was a wide field open for other undertakings of the kind, and any other company which sought to carry out the same object ought to regard with a favourable eye the exertions of the Atlantic Telegraph Company, and, benefiting by past experience, he hoped they would go hand in hand with them. The field was large enough for all. If twenty cables were laid down, he hardly thought they would be able to supply the demand. It had been mentioned by Mr. Masey that another cable was being formed by a new company, and he truly gave, to a certain extent, the projects of that company; but he was mistaken on some points. In the first place, it was true that the proposed route was not the same as that which had been taken by the Atlantic Telegraph Company. It was to leave Brest and to touch at the Island of St. Pierre. He believed that the French Government had regarded that route favourably, and had given a concession for the lengthened period of fifty years, and that a subvention would be granted, so that he trusted that company would soon be in honourable competition with the Atlantic company; and if both succeeded, there would still be room for many more cables. It had been lately proposed that a survey should be made previous to any other undertaking being previously commenced; and he had recently heard a paper read before another society, in which it was proposed that a belt of five miles across the Atlantic should be surveyed, which should be completed before any other cable was laid down, and he understood that application had been made to the Government for the grant of vessels for that survey. On the occasion to which he referred he saw a line laid down on a map representing the line of soundings which Captain Dayman took across the Atlantic. He was of opinion that if they could make an accurate survey of a belt of five miles, and if they could ensure that the vessels laying the cable could keep that line, it might be desirable to delay the operations till that survey was made; but he believed if a vessel started from the coast of Ireland with the best navigators in the world, and the best instruments that could be obtained, it would be totally impossible to keep within that belt of five miles. The action of the wind and the currents, and other influences, made it almost impossible for a vessel to be kept within that belt; and even if this could be done, it was questionable whether such a survey would render it possible to avoid the inequalities of the bottom, so as to prevent injury to the cable. With regard to the cable itself, he had conversed with a great number of electricians, the most scientific men of the day; and it appeared to him that the scientific element was further advanced than the practical element. They approached very near to agreement with regard to the core of the cable, but when they came to the strain upon that core, and to the protecting covering of the cable, they all seemed to disagree. He had already said he believed the great weight of the cable was an element of self-destruction, and that another cable of the same kind would be destroyed by the same means, even if the most perfect results in the manufacture were secured. He thought he might say it was owing to the failure of the first cable that a second company had been projected whose object was to employ a cable of less specific gravity, and he did not see what possible objection there could be to it. The question of the outer covering of the cable was one which he was most anxious to see satisfactorily determined. If it could be proved that beyond a certain depth the cable did not require protection from marine insects, the difficulty could easily be got over; but when they came to question the men of science of the day, none of them would say that the cable was not liable to the attacks of those insects, and they knew if worms were there, they would eat the hempen covering of a cable into shreds. He felt certain, therefore, there must be some better kind of protection for the cable; he considered iron was too weighty for the purpose, and at certain depths, instead of adding to the strength of the cable, it was in itself an element of weakness, because the greater the weight the greater the power of the momentum would be, and the heavier the cable was the greater would be the strain upon it in paying it out. Professor Wheatstone had prepared a cable which might be laid at the bottom of the sea, and answer all practical purposes, and would cost only half the amount of the former cable, if only they could be satisfied that it would be secure from the attacks of insects; but they knew that crabs and other marine animals had been brought up from great depths; and a gentleman in Paris had produced a glass of sulphate of copper with a long living worm in it, notwithstanding it had been supposed hitherto that sulphate of copper was the best preservative of hemp from the attacks of those insects. He was therefore brought to the conclusion that if an outer covering were required for the cable, it must be a metallic one.

Dr. WALLICH said, although he was prepared to afford all the information he could with reference to the deep-sea bed, he had no idea that he should be called upon to defend some propositions which had been laid by him before the Geographical Society. The main fact with which he started was this, that the evidence with regard to the nature and contour of the deep-sea bed was wholly inadequate to the requirements of ocean telegraphy. Two lines of survey of the Atlantic had already been made, one by Lieutenant Berryman, and the other by Captain Dayman. That of Lieutenant Berryman was unfortunately found to be untrustworthy. The committee of the United States navy gave a distinct opinion that the discrepancies between the log, the chart, and the report were so great, that the line of soundings could not be relied upon. We had, therefore, to fall back upon the single line of survey taken by one of our own naval officers, Captain Dayman, but when he mentioned that in an area extending over 1,300 geographical miles, only 41 soundings were taken at intervals of from 30 to 70 geographical miles, every one must be aware that in those intervals where no soundings were taken, alterations of level might exist of sufficient extent to be dangerous and fatal to a cable. He had lately brought before the Geographical Society a proposition which was intended to obviate the insufficiency of the surveys already made. Even if Capt. Dayman's line of soundings were considered sufficient, if the cable could be laid absolutely along that line, he should like to know how the ship which was to pay out the cable could follow accurately in the wake of the ship in which the survey was taken? To obviate this he proposed that a belt, not of five miles, but of two miles, should be surveyed. The question had been raised that evening whether it was practicable for a ship to be kept within the course of a belt across an extensive area like the Atlantic. Having read an extract from the report of Sir Leopold McClintock on this subject, which favoured the view that a ship could be kept within the two mile belt, Dr. Wallich added, that what he proposed was that two vessels should undertake the survey of a belt of two miles across the Atlantic, to sail in parallel courses, and to take alternate soundings at five mile intervals, so that when the intervals were five miles, the diagonal intervals between the soundings on the two opposite lines would be only about two miles and a half; so that instead of intervals of 40 miles he proposed intervals of only 2½ miles

and in the place of 41 soundings, there should be 700 soundings, which could be accomplished in about five months and a half, at the rate of about three soundings per day. He would put it to the meeting whether it would not be more satisfactory to await the results of such a survey as he had suggested before consigning another half million of money to the bottom of the Atlantic?

Admiral Sir E. BELCHER wished to offer a few observations on several of the subjects which had been started. First with regard to the aurora. In the year 1825, when employed in Behrings Straits, with the late Admiral Beechey, every effort was made to trace the disturbance of the magnetic needle during the most brilliant exhibitions of the aurora, but without detecting the most minute disturbance. In the last Arctic search by Government, the most delicate magnetometers, acting precisely as those described by Mr. Masey, by reflection over great arcs, were used during two years, with observers noting every 2½ minutes during the dark season for disturbances generally. Many disturbances were noted, but none were detected during the visits of the aurora. He, therefore, refused to give any credit to the statement that the aurora produced an electric disturbance in cables under water. Next as to the course to be selected for laying the cable. If it was to be laid on the shortest line, that by great circle sailing was the best, and he was satisfied that by adopting the apparent northerly arc from the Faroe Islands, skirting Iceland and Greenland, the actual distance would be shortened between the extreme land ends in comparison with that proposed hitherto, by at least 250 miles. Then as to deep-sea soundings. Landsmen imagined it a very simple operation; naval surveyors knew to the contrary. It was supposed to be a very simple act to throw overboard a lead with line attached, and to reach the bottom vertically. But so faulty was this mode, that Massey, Burt, Ericsson, and others, invented machines by which the actual vertical passage of the lead alone was measured. But this demanded that three times the length of slack should be thrown overboard, and no positive sensation as to when the lead first struck ground was obtained; consequently, in the case of a lead striking on a steep incline, it might afterwards slide down to the bottom, and no indication whatever of a peak, oven close to the surface, would be obtained. But another important problem was involved. It was generally imagined that currents were merely superficial. That was a grave error, and one well recorded fact was worth a thousand assertions or theories. Some of his officers were there present who had taken part in delicate operations of this nature, and would speak for themselves. The very important duty had been especially entrusted to him by government, "to determine at what depth the strongest currents begin to vary." He selected a calm when about 10 miles off the Cape de Verd on the Coast of Africa, where a five-knot current ran. Five boats were lowered, with lines of 200, 400, 600, 800, and 1,000 fathoms respectively; a deep sea lead of 28lbs. in a basket was attached to each, and each line buoyed by a cask, with a flag-staff and flag, in order to measure their positions relatively with each other as to drift. The ship had the deep sea-sounding bottle attached at 1,200 fathoms. At the expiration of two hours the whole had drifted ten miles past the Cape, but the ship and boats were nearly relatively in their same positions. Therefore, as deep as 1,200 fathoms, the current ran with the same velocity. There were many other cases which he would pass over. In 1838, when perfectly calm, the water bottle and other thermometers were sent down in 1,200 fathoms off the Galapagos, on the Equator in the Pacific. The line was perpendicular, yet the ship was drifting swiftly past the islands. In both these cases reliable landmarks were available to determine the rate of drift; but at sea, who could determine this? Now, as to the rate of descent, it would be found (see p. 796, "Nautical Magazine," 1843), that it required 2 hours, 13 min., 22 sec., for a lead of 12lbs., with a fine whipcord line attached, to descend 3,000 fathoms. What would a mere 28lb. lead require with a line strong enough to recover it, and what time would be consumed in hauling it in steadily to prevent jarring, as well as stopping to disengage thermometers, if the operation was to be accompanied by scientific research? It was all very well to talk about scientific officers, and scientific observers, but who could test their value? With a set of ten observers, even with the simple observation at noon for the latitude, he had witnessed miles of discrepancy, and when it came to fix positions—hours before or after noon—he felt no confidence in any observer. It was all mere guess-work; therefore the idea of following out any given lines on the pathless ocean was a mere speculative dream. If they required the true survey of the line betwn the two Continents, to lay down the cable, let them attach very slender lines at certain distances, with floating reels, and let a small vessel follow and pick them up, noting each true depth, but losing the lines. He had used the simple cotton reels, containing 200 yards, or 100 fathoms each, adding others as the depth required, and obtained truer soundings than the great lead line would effect. The length of the lines supplied by Government for this purpose exceeded the circumference of the globe, and yet the cost did not exceed £15. That, therefore, was the cheapest as well as the only mode by which any reliable survey of a line across the Atlantic could be effected. If we had enough data for laying down these electric cables, he saw no reason to incur such enormous expense by mapping the Atlantic, and blotting our charts with soundings, which were placed merely at haphazard.

Colonel SHAFFNER rose for the purpose of correcting one or two errors contained in the paper. On behalf of his countryman, Mr. Morse, he might be permitted to correct the statements of Mr. Masey with regard to the dates of that gentleman's inventions. Credit had been given to Mr. Morse for inventing his process of telegraphing in 1843, whereas it was in 1832. His application for a patent in America was made in 1837; his French patent was dated 1838, and a subsequent patent taken out in America was dated 1840; and the first telegraph line was constructed by Mr. Morse in 1841. As an old associate of that gentleman, he felt it his duty to make these corrections of dates relative to his inventions in telegraphy. With regard to the North Atlantic route, in which he (Colonel Shaffner) took great interest, it was stated in the paper that no results were obtained by the surveys of the *Bulldog* and the *Fox*, in the year 1860. In that year Sir Leopold M'Clintock surveyed the route between Scotland and the Faroe Islands, and thence to Iceland, Greenland, and Labrador; and the result was, that Sir E. Belcher and others were of opinion that it was a practical route for a line of telegraph to be carried, and so favourably had it been regarded, that he was informed by friends who had the enterprise in charge, that they had one-fourth of the capital in hand for the construction of a cable to be carried by that route. They offered no opposition to any other route. In the early days of telegraphy he was of opinion that monopoly in such matters was beneficial, but he was of a different opinion now. He should be delighted to see all the projects for telegraph communication with America carried out, and if they were accomplished, he believed all would be benefited, and the public would be better served. He wished success to them all.

Captain SELWYN, R.N., said he believed he was known to some of the telegraphists present, as having proposed a different mode of submerging cables to that which had been generally adopted, but he would not refer to this, but would confine his observations to the matters treated of in the paper, and whilst he expressed his admiration of the comprehensive and extremely careful manner in which Mr. Masey had furnished them with the history of what had been done up to this time, there were some points in that history to which he entirely demurred.

With regard to the soundings taken by Captain Dayman, although they were a considerable distance apart, they resulted in laying down a line from Ireland across the Atlantic, which, so far from being precipitous, had a descent of only 1 in 16, whilst the greatest descent which was found by the *Porcupine* was 1 in 19, neither of which gradients he thought was to be feared in the laying down of a cable. Mr. Masey had ably remarked upon the probable causes which led to the failure of the Atlantic cable, and had fairly expressed his opinion as to how that might have been expected to have taken place, but he begged to add to those remarks that in that failure, evidence was afforded that the outer wires to which they trusted for strength failed in their object, and permitted the internal core to become separated. He was the more induced to refer to this point, because he found that there was still a disposition to adhere to the mechanical fallacy of surrounding a straight core with a spiral covering, and then expecting the covering to take the strain, which, of course, it could not do. If they could prevent corrosion from the water and abrasion from the bed of the ocean, by the interposition of other material than iron, he questioned whether the wire covering answered any good purpose, as it was known that iron wire corroded more rapidly in salt water than in fresh, and, therefore, cables of that character required a covering of hemp or other tarred material. Then came the question, with a cable of that bulk and weight, what description of ship must be employed to pay it out. The *Great Eastern* herself could not take such a cable on board. The *Agamemnon* could only carry a portion of the last Atlantic cable in her hold, and was obliged to carry a heavy deck coil; and he was told by an officer who accompanied the expedition that if it had been possible, they would, at one time, have hove that part of the cable overboard to ease the ship. He thought, although the failure of the cable might be, in some measure, attributable to the coiling, it was still more due to the want of strength in its construction. In determining the route along which a cable should be laid, one great consideration was to provide for the landing of the ends in positions where they were not exposed to the fouling of anchors, and with that view a locality should be sought for where there was such a depth of water as would avoid such a risk. The shore ends would always remain a difficulty so long as they selected sandy bays or shoals for the landing. If they wished to preserve the cable from the injuries to which it was generally exposed at the ends, they ought never to take it where there was less than 100 fathoms water, and the more precipitous the shore was the safer it would be, even to the extent of carrying the cable up the face of a steep rock. There was one route which he thought worthy of consideration which had not been mentioned,—that was about 300 miles to the eastward of the great bank of Newfoundland, which was to be avoided because the fishing smacks anchored upon it. At the locality he referred to they might lay the land end of the cable in from 50 to 100 or 200 fathoms, and it was quite practicable to lay it in that depth of water, and be able to pick it up again if necessary; from thence they might run it to the more distant shore, whether at Halifax or elsewhere. He denied those conclusions which pointed to the idea that nautical men could carry on any other operations at sea than by the mercy of Divine Providence, for no human contrivance could carry a cable across the ocean in the face of the elements. Captain Selwyn having described the effects which the pitching of a vessel in a gale had upon the paying out of a cable in the production of kinks, which occasioned so much damage to the cable, concluded by remarking that by the plan he had introduced for coiling the cable, preparatory to its being laid, it could be kept in water from the time of its manufacture until it was laid down, and in the paying out, if the cable broke within six miles of the stern of the vessel it could be caught and retained. In the event of a nautical assessor being appointed on any future committee upon this subject, he hoped to have the honour of explaining his invention to that gentleman, and to have the opportunity of substantiating opinions which had received the sanction of many of the most eminent members of his profession, some of whom had had large experience in the laying down of cables.

Mr. MACKINTOSH had listened with great pleasure to the interesting discussion which had taken place that evening on the subject of submarine telegraphy, but the speakers had omitted to notice one of the most vital points in the whole matter, that was, how long perfect insulation could be maintained in long lines of submarine cables. It was a well known fact, that both gutta percha and india rubber were absorbents of water to the extent of 20 or 25 per cent., but in large conductors with considerable insulation, they would remain practically useful for some time, though afterwards they gave way; and therefore, with reference to the maintaining of these long deep sea cables without some better protection than had yet been given to them, he thought there was no chance of a successful result. The opinion of those who were best acquainted with the subject was that the question of insulation, as applied to long lines of submarine cables, was very far from having received a satisfactory solution. It was very well where they had large conductors and short working stations, but when they came to lines of between 2,000 and 3,000 miles, unless they protected the gutta-percha insulator with an impervious material, he believed it would be impossible to succeed with long lengths of submarine cables. With reference to the destructibility of cables from marine insects, it was a well known fact that they had a great antipathy to carbon. In preparing an outside covering he believed India-rubber, mixed with large quantities of carbon, was the most practical and economical preservative, and the strands of wire might be firmly embedded in that material. He thought that as an insulator, collodion was well worth a trial, and he would suggest that an experiment with wire of No. 16 gauge, covered in one case with gutta-percha and in another with india-rubber, and in a third with collodion, should be laid; he believed the result would be found to be that, under a pressure of two or three tons, both the gutta-percha and the india-rubber would lose their insulation, whilst the collodion would remain as compact as a piece of glass.

Mr. CROMWELL VARLEY said at the late hour to which the proceedings had extended, he could not touch upon many of the topics which had been introduced in this paper. With regard to the influence of the aurora borealis upon the telegraph wires, he would state that in the distance from London to Ipswich, only 70 miles, he had found the tension produced by the influence of the aurora equal to 150 cells of a Daniell's battery, and this phenomenon affected submarine cables and air wires alike. These currents passed through the surface of the earth itself; and it had been observed by the Astronomer Royal that, about three days after any atmospheric disturbance of that kind took place, there was a change in the weather, and those observations were forwarded to Admiral Fitzroy, to assist him in his forecasts of coming storms. The next point he would allude to was that the specimen of cable before them was not that which was proposed for the main length of the new Atlantic line. It was a specimen of the shore ends only. It was obvious that no ship in existence would be able to carry such a length of cable of that size as would be required to reach from Ireland to Newfoundland. With regard to the action of marine insects, it was noticed in the Mediterranean, on the line from Toulon to Algiers, when an accident occurred to a cable (which was covered with steel wires, each of the wires being covered with tarred hemp, and the parts were picked up at 1,600 fathoms) that the marine animals had eaten the hempen yarn from the cable, but they had not touched the gutta percha: On the lines from Malta to Alexandria and from Sardinia to Corsica, which were in good working

order; although the insects had eaten into the hemp, they had not eaten into the gutta percha. With reference to the pitching of vessels in paying out a cable, it was right they should understand what took place in that operation. Of course they could not control the weather. Unless they were prepared to lay a cable in a gale of wind as well as in smooth water, it was useless to attempt the operation. In the laying of the Atlantic cable there was never a greater angle than 15 degrees to the horizon. The vessel pitched, but the strain upon the cable was not nearly so great as if it hung perpendicularly from the ship. The paying-out machinery was furnished with friction gear, and in any extreme strain the machinery yielded to it. The cable between England and Holland was laid last year in the same way, and he had no hesitation in asserting that there was not a single kink in the whole of that cable. He quite agreed in the desirability of further surveys being made across the Atlantic, not only as regarded the direct route, but also as to the northern route. The general result of the soundings up to the present time was that in no one instance had the lead brought up anything but the softest ooze. One gentleman had suggested that a cable to America should consist of several wires; but regard must be had to the amount of induction. As they lengthened the line they weakened the currents through the cable, but increased the inductive resistance, and the having more wires than one in the same cable still further increased this action, so that he thought it was practically impossible to work a cable with more than one wire from this country to America. He wished to state this fact, which ought to be borne in mind, that had it not been for Professor Thomson's elegant instrument, with 70 yards of wire upon it, the Atlantic cable would never have spoken at all. Reference had been made to a proposed telegraph without wires, a system introduced by Mr. Haworth. He should be glad if the chairman would favour the meeting with an explanation of that system, for he had been informed that Sir Fitzroy Kelly and the learned chairman were both strong believers in the success of the scheme. He (Mr. Varley) had tried the experiment on a very small scale in his own garden, with stations only eight yards apart, and although he employed a galvanometer of the most sensitive kind he could not get the slightest trace of a current.

Mr. THOS. WEBSTER, F.R.S., rose to suggest the propriety of the adjournment of this discussion till the following meeting. He remarked that a subject of this vast importance, involving so many questions of interest, could not be properly discussed in the brief time which remained after the reading of the paper. Although this subject had been discussed before several of the scientific societies, yet this Society, from its constitution, afforded the widest scope for doing so in a manner which its great interest and importance called for.

The CHAIRMAN said he was informed that arrangements had been already announced for future papers for several succeeding nights of the Society's meetings. Therefore all they could do would be to request the Council to fix upon as early an evening as possible for the renewal of this subject.

Mr. J. H. MURCHISON said, as one of the oldest members of the Society, he recollected occasions on which the discussion of subjects of less public importance than this had been adjourned to a future evening, and he would strongly support the suggestion of Mr. Webster that the same course should be adopted on the present occasion.

After a few further observations from Mr. WEBSTER,

The CHAIRMAN said he had no doubt arrangements would be made to afford an opportunity for a further discussion of this subject. With reference to what had fallen from Mr. Varley, he begged to say that he had seen no experiments whatever with the system of telegraphs without wires, and had never expressed any opinion upon it. He had given his advice with reference to legal matters, but had never expressed any opinion relative to the merits of the invention, one way or the other. He now begged to propose that the best thanks of the meeting be given to Mr. Masey for his paper.

The vote of thanks having been passed,

The secretary announced that on Wednesday evening next, the 4th February, a paper by Mr. Alexander Burrell, "On Cooking Depots for the Working Classes, recently established in Glasgow and Manchester," would be read.

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The Secretary has received the following letter:—

SIR,—During the discussion last evening several speakers made allusion to hemp. It is worthy of note in these proceedings that the pressure of the sea at great depths destroys the fibre; and it will be found in Scoresby's remarks that whale lines which had been (some hours only) at bottom attached to harpoons in the whale were rendered useless; that wood of various densities, as well as cork, had all their air vessels disrupted, and would not float when they had undergone the pressure of 1,000 fathoms. It is well known that port wine, however well corked and covered with bladder and resin, is changed at 500 fathoms, and the bottle, with cork inverted, comes to the surface simply containing salt water. The pressure on the gutta percha of the cable would press home and expel all air; but unless again brought to the surface, no air could escape under the condensed condition of the gutta percha. We should therefore receive with caution all assertions as to the condition of cables recovered from great depths, the bringing to the surface having played the second part, as in condensing and exhausting.

Yours, &c.,
E. BELCHER.

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In order to afford an opportunity for a further discussion on the Submarine Telegraph, a paper on this subject will be read by Mr. Thomas Webster, F.R.S., at the meeting on Wednesday evening, the 11th February. Captain Symonds, whose paper on "Twin Screw Steamers" was fixed for that evening, has kindly allowed its postponement to the 4th March.

## ARTISTIC COPYRIGHT.

A meeting of Painters, Engravers, Publishers and other persons interested in the better protection of Artistic Copyrights, was held at the French Gallery, Pall Mall, on Wednesday evening last, convened by circular as follows:—

"French Gallery, 120, Pall Mall, 24th January, 1863.

"SIR,—You are invited to attend a meeting of Painters, Engravers, and other persons interested in the better protection of Artistic Copyrights, to be held at the French Gallery, 120, Pall Mall, on Wednesday, the 28th instant, at eight o'clock, p.m., to consult as to the best course to be adopted to obtain from Parliament an effective Act on the subject. (Signed)

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| "S. COUSINS, R.A. | T. LANDSEER. |
| D. COLNAGHI. | C. G. LEWIS. |
| GEORGE DOO, R.A. | D. MACLISE, R.A. |
| W. P. FRITH, R.A. | J. E. MILLAIS, A.R.A. |
| E. GAMBART. | J. H. ROBINSON. |
| F. GOODALL, A.R.A. | H. T. RYALL. |
| HENRY GRAVES. | W. H. SIMMONS. |
| HOLMAN HUNT. | C. STANFIELD, R.A." |

The chair was taken by Sir THOMAS PHILLIPS, Chairman of the Council of the Society of Arts, and a Deputation from the Council attended,

consisting of Mr. J. G. Frith, Mr. Wm. Hawes, Mr. Thomas Sopwith, F.R.S., and Mr. Le Neve Foster, Secretary. The meeting was very fully attended by artists, engravers, and others.

The following resolutions were passed:—

Proposed by Mr. E. GAMBART, seconded by Mr. J. C. ROBINSON, A.R.A.:—

"The principle that artists are entitled to a copyright in their works having been now acknowledged by Parliament in numerous Acts, beginning with the reign of Geo. II., and ending with the Act of last session, it is expedient, in the interest of the public, as well as of artists, that the law should be made efficient for maintaining and securing all their rights."

Proposed by Mr. WM. HAWES, seconded by Mr. JOHN DILLON:—

"That engravers and publishers of engravings and prints are entitled to the protection given by the 25th and 26th Victoria to publishers of photographs."

Proposed by Mr. ERSKINE NICOL, R.S.A., seconded by Mr. THOMAS LANDSEER:—

"That in order to rescue the art of engraving from the destruction with which it is threatened by infringements of copyrights, it is indispensable that the offences of making, selling, exhibiting, or in any way dealing in piracies of whatever kind, be repressed by summary proceedings before any two Justices of the Peace."

Proposed by Mr. E. GAMBART, seconded by Mr. J. R. HERBERT, R.A.:—

"That England, having contracted with several countries, and especially with France, treaties for reciprocal protection of copyrights, under which English interests are perfectly safe in France, while French copyrights have no effective protection here, it is essential to the dignity and fair dealing of this country that so unjust a position should not be maintained."

Proposed by Mr. J. G. FRITH, seconded by Mr. J. P. KNIGHT, R.A.—

"While the necessity for summary procedure in England for all offences against the law of Artistic Copyright is immediate and pressing, a general consolidation of those laws, and the assimilation of the Art Copyright laws of the great countries of Europe is also desirable, and that this need ought to be represented by the Artists and Publishers of each nation to their respective governments, with the view to bringing about some common action among them."

Proposed by Mr. R. REDGRAVE, seconded by Mr. E. FIELD:—

"That the thanks of those interested in the fine arts are due to the Society of Arts for the labour and perseverance to which the Act of the last session of Parliament is mainly to be attributed, and that they be requested to continue their assistance till the law on these subjects is made efficient and clear. And we would especially thank their chairman, Sir Thomas Phillips, for attending and taking the chair on this occasion, and also the members of their deputation for their attendance and aid."

At the conclusion of the meeting, on the motion of Mr. HAWES, seconded by Mr. SOPWITH, a cordial vote of thanks was unanimously passed to Mr. Edwin Field for his valuable services in connection with the Artistic Copyright Act of last session.

## AWARDS OF MERIT AT INTERNATIONAL EXHIBITIONS.

(*Continued from page* 174.)

In August last the Council of the Society of Arts issued a letter, inviting the opinion of the Jurors, the Commissioners for the Colonies and for Foreign countries, and the principal Exhibitors at the International Exhibition, on the question of Awards of Merit in connection with International Exhibitions; and requesting replies to the questions given below, with the intention of embodying the answers in a public report.

### AWARDS OF JURIES.

1.—Are you of opinion that Awards for Merit, by medals or otherwise, in International Exhibitions, are desirable?

2.—State the reasons for your opinion.

3.—Ought Works of Fine Art and Designs to be excluded from the awards?

4.—Can you suggest any better method than the appointment of jurors for making the awards?

5.—Can you suggest any improvement in the constitution or proceedings of the juries?

6.—Is any appeal from the decision of the juries desirable?

7.—If you think awards undesirable, can you suggest any other means by which meritorious productions may be brought to the notice of the public?

8.—Have you any further suggestions to offer on the subject?

The following is a summary of the replies received. The figures attached to the replies correspond with those of the questions:—

E. B. ROBERTS, Juror, Secretary, and Exhibitor, Class XXV*a*.—1. Yes. 2. Were it not for the incentive of reward, not one-fourth of this year's contributors would have responded. The criticism of competent and impartial judges at Exhibitions assists in bringing forward inventions which without it would not be known. Exhibitions create that spirit of competition and rivalry so necessary to excellence. Many leading manufacturers no doubt decline to enter the field, on the plea that awards are unjustly made, but that can form no valid objection to the principle. As the exhibitors were, to a certain extent, selected in the allotment of space for exhibition, it is not a matter of surprise that a large portion is entitled to distinction, but one grade of medal only creates a difficulty. From experience as juror, thinks there should be two grades of medals and an honourable mention. 3. Fine arts and designs should not be excluded. 4. No. 5. Suggests there should not be less than three English jurors in any class, each possessing a practical knowledge of the production of the articles from the raw material, with one foreign similarly qualified juror from each nation largely contributing. 6. Juries having been selected from persons eminent for special knowledge, their judgment should be final. The possibility of appeal would tend to relieve them of the responsibility. Suggests, if an exhibitor be dissatisfied with the judgment, he should have the option of withdrawing his goods from competition before the commencement of the labours of the jury. Once submitted, the decision of the jury should be final. 8. In Exhibitions, which are not bazaars for the sale of property, but for the attainment of excellence in design and workmanship, no person should be accepted as a contributor who is not the manufacturer.

JOHN ROBERTS, Exhibitor, Class XXXV.—1. Yes, unquestionably, awards for merit, but not with medals. 2. Stimulus to manufacturers to excel in the production of

superior articles. 3. No, should be encouraged by every fair means. 4. No, provided they be properly selected and conversant with the articles, and not exhibitors of the same. 5. No, unless it be as stated in answer No. 4. 6. Yes, where exhibitors are dissatisfied, they should be heard in defence to explain. 7. A certificate from the jurors, assigning why the same was given, would be preferable to medals. 8. None but *bonâ fide* inventors or manufacturers should have certificates. The same to be classed for fine arts, designs, improvements in machinery, articles of utility, philosophical instruments, ornaments, &c., &c.

AUGUSTE ROGUES, Chef de Service, Secrétariat de la Commission Impériale Française.—Le principe des récompenses tient au principe même qui préside à l'organisation d'une exposition. Les récompenses seraient inutiles, et présenteraient même une contradiction choquante dans une Exposition dont un pur intérêt mercantile formerait le fondement. Il n'y aurait plus évidemment à s'occuper de récompenses si, comme on le donne à entendre dans le rapport Anglais de l'Exposition de 1855, les Expositions universelles devaient, dans un avenir rapproché, se transformer en bazars universels. Il est vrai de dire que ce système ne paraît pas avoir fait jusqu'ici son chemin dans le monde: espérons qu'il restera dans le domaine des paradoxes. Les Expositions perdraient en grande partie leur intérêt général et leur action civilisatrice le jour où elles n'auraient pour but et pour stimulant que des avantages commerciaux immédiats. Personne ne l'ignore, les maisons de troisième ou quatrième ordre trouvent seules quelque utilité réelle à figurer aux Expositions; les grands fabricants n'ont rien à en espérer sous ce rapport. Leur production suffit souvent à peine à leur clientèle, leur réputation peut difficilement s'accroître; s'ils exposent, c'est pour contribuer au succès de leur pays respectif; et, pour assurer ce succès, ils ne reculent devant aucun sacrifice de temps ni d'argent. Il est utile d'encourager les dévouements, et il est juste de les reconnaître. C'est le point de vue d'où les peuples, les souverains et les bons esprits doivent se placer pour juger les questions des récompenses. La France, forte d'une longue expérience, a depuis long-temps adopté, pour les Expositions nationales et universelles, le système des récompenses, et elle l'applique largement sans reculer devant aucune de ses conséquences. Elle veut que tous les genres et tous les degrés de mérite soient distingués, aussi bien dans les arts que dans les sciences et l'industrie. Ce qu'elle faisait pour ses Expositions nationales, elle l'a fait pour son Exposition universelle. Elle a traité les étrangers comme s'ils étaient de la famille; et loin de chercher des économies sur la valeur des récompenses, elle a créé une médaille d'or de plus en 1855. Aux Expositions nationales, les récompenses consistaient—sans parler de l'Ordre de la Légion-d'Honneur—en trois médailles, médaille d'or, médaille d'argent, médaille de bronze, et en une mention honorable. En 1855—sans parler également de l'Ordre de la Légion-d'Honneur, accordé à un grand nombre de fabricants étrangers—il y a eu quatre médailles; une grande médaille d'or, une petite médaille d'or, une médaille d'argent, et une médaille de bronze, plus une mention honorable. Il n'est pas d'efforts, de talents, de mérites que l'on ne puisse, avec ce système, spécifier et récompenser. Il est de mode de médire des opérations des jurys des Expositions. Si l'on voulait peser les critiques, on les trouverait bien légers. Il y a sans doute des améliorations à introduire dans la façon d'opérer du jury; la Commission Royale de 1862 a fait un grand pas dans cette voie en renfermant les opérations dans les deux premiers mois qui suivirent l'ouverture, et en proclamant les récompenses au commencement environ du troisième mois. Il conviendrait, je crois, de permettre aux exposants de faire appel des décisions du jury. Les présidents, réunis en conseil, ne font que reproduire les raisons et les faits qui ont déterminé les membres de leur jury spécial; un grand nombre d'entre eux, fatigués de leurs travaux précédents n'assisteraient pas au conseil. Il vaudrait mieux que les appels fussent jugés administrativement par la Commission même de l'Exposition. Elle se ferait assister d'hommes spéciaux; elle aurait, plus que tous autres, de grandes facilités, avec ses nombreux agents et son autorité spéciale, pour obtenir les renseignements nécessaires, surtout lorsque les appels proviendraient d'exposants étrangers. Je terminerai par une dernière considération. Il est d'usage de placer, comme présidents dans les jurys, des hommes éminents revêtus de hautes fonctions, dont le temps est si précieux qu'on les voit à peine paraître à leurs réunions. Il serait mieux de ne composer le jury que de personnes ayant, non-seulement la volonté, mais la possibilité d'accomplir très-fidèlement leurs mandats.

The MARQUIS OF SALISBURY, Chairman of Jury, Class X.—1. Yes. 2. If no opinion of the merit of any invention or improvement is expressed from authority, the Exhibition ceases to be anything but a bazaar on an extensive scale. 4. None. Is of opinion that a better classification of the objects exhibited is wanted. 8. Decidedly of opinion that lists of the objects rewarded in the Exhibition of each nation should be appended in large characters to the department occupied by that nation. This would attract the public to the inspection of what is most worth looking at, promote rivalry, especially if the word "best" could be put to those articles which excelled those of other nations, and the public notice would prevent fraud in claiming prizes hereafter.

A. SALOMONS, Chairman of Jury, Class XXVII.—1. Yes; awards very desirable, and medals the most effectual mode of marking such awards; honourable mentions good to mark where merit, although considerable, is not of sufficient importance for a medal. 2. Stimulate exhibitors; induce inventors to excel and improve. Of great value to producers of good articles of new invention, especially in the case of young beginners. 3. Works of Fine Art should not be excluded. Designs are essential to manufacturers, and designers should be stimulated. 4. Nothing better than a properly constituted jury. 5. Men of undoubted character and position in the special trade should mainly constitute the juries of that class, and a sufficient number should be on each, so that party feeling would be overruled by a majority. The appointment of jurors should be made of those who have been, and are, the most renowned in each trade. Persons who have retired from active co-operation in the business should be associated with those who are still actively engaged in it, so that the improvements of the present time may not be overlooked. 6. Yes; oversights and mistakes always likely to occur. A jury composed of the chairmen of all the juries would be the best to decide such appeals, and the jury whose judgment is appealed against should be invited to attend. 7. Considers awards desirable. 8. (*a*) That more definite and specific rules should be laid down for the information of exhibitors—for the guidance of committees, as to who should be allowed to exhibit—and for the direction of the juries in giving their awards. For want of this, much of the dissatisfaction in respect to the present exhibition has arisen. (*b*) In some classes, for instance, in the present exhibition, retailers have been excluded by metropolitan committees, and retailers of similar goods have been allowed to exhibit by provincial committees; either all should be admitted or none. (*c*) It should be better defined, as to whom medals or honorable mentions should be awarded. Uniformity in the awards of the various juries is most important. In the present exhibition are found some juries awarding prizes to mere collections of articles, and other juries refusing them to even more meritorious collectors, from their having laid down a rule not to give awards to any but manufacturers. (*d*) Unfair to give prizes to mere purchasers of objects, purchased for the express purpose of exhibition, and in the manufacture of which the exhibitor in many cases has not taken any part. (*e*) In the present exhibition the awards have also been made to retailers in a very unsatisfactory manner. (*f*) Suggests that none

but absolute manufacturers (those only who employ workmen and pay them wages), should receive medals, and that producers exhibiting works designed by them, or collections collected by them, should receive honourable mentions only, where considered sufficiently meritorious. (*g*) Is aware that the word "manufacture" admits of widely different constructions, and therefore requires some special regulation to be laid down. For instance, in the production of a piece of printed muslin; one man gives the design to another man to draw, then to another man to engrave, and again to another man to print on the cloth manufactured by another manufacturer; who, is in such case to be considered the real manufacturer? or who is to be entitled to the medal if the production is worthy of it? The producer or director of the whole should be rewarded in some way, and this has been refused by the jurors in several classes, showing strongly the great necessity for more unity of action. (*h*) Jurors should be rewarded by a medal, or by some particular mark of merit which would show that they had attained such a position in their trade as to be selected judges of the works of others. This necessary, because jurors cannot receive medals for any manufactures of their own which may be exhibited, and this places their goods at a disadvantage in the eyes of the public compared with the productions of other manufacturers to whom medals are awarded.

SANSOM DUFAVILLE AND CO.—1. No. 2. Because of the many glaring and grievous errors in most Exhibitions, this in particular, where interest, display, or puffing names have been rewarded, respectability and real merit simply mentioned, and in many instances entirely unnoticed. 3. Yes; because they are in most instances valuable or otherwise, according to various tastes, subject to the difficulty, and to errors, &c., mentioned in answer No. 2. 4. If awards should be considered desirable in future Exhibitions, trusts that some better, if possible, method will be devised in selecting the jurors. Here is the evil, but at a loss to suggest a remedy. Impossible for any jury, however impartial, to do justice in all cases. 5. The names of the owners of articles exhibited should be, if possible, kept from the jurors until after the awards are made. 6. Yes, most desirable, and a searching investigation made; exhibitors called and questioned on oath if necessary. 7. Exhibitors would come freely and show their productions in the best style possible, and trust the public for awards, whom they know to be the best judges. 8. No.

R. ANGUS SMITH, Ph.D., F.R.S, F.C.S., Juror, Class XB.—1. Yes; at least nothing that happened does in the least speak against the system of awards, but sees no necessity for medals. An opinion clearly expressed is the greatest reward or condemnation—of the greatest value to the inventor, when favourable, and the greatest gift to the public, whether the opinion be favourable or unfavourable to an invention. 2. (*a*) Because opinions are very much desired by inventors and by manufacturers generally. When favourable, an opinion is a reward; when unfavourable, a lesson. (*b*) Because they are needed as well as desired by a class of men who can give no proof to the world, on a sufficiently large scale, of the value of their work. (*c*) Because the world is in actual want of an opinion on inventions brought before it, they being put to great expense in trying schemes of which a special knowledge would quickly show the folly. Opinions formed by skilled men would preserve them from many gross deceptions. The public, no doubt, frequently teaches the skilled man, and forces new truths upon him, but this we cannot expect to be constantly the case; besides, although an uneducated man may teach an educated man some things, we do not for that reason diminish our desire or respect for education. 3. Does not feel sure that we are fit to give just opinions on matters of taste just now, as there is little unity of feeling in these matters, but, abstractly, there is no fitter subject for awards than that which we observe in fine arts and designs, and history encourages the practice. Therefore, it would be well to include them, and take the risk of unpleasantness caused by real or fancied mistakes of a jury. Improvement would come. 4. The appointment of jurors for giving awards of of any kind seems to me the only possible mode. It would be absurd to leave the work to one man, and impossible for one man to do it, and if more be added, a jury is in reality formed, no matter what name be given to it. 5. The constitution of the juries of the Exhibition of 1862 was on very correct principles. The mode of proceeding was not so correct. From the very nature of the proceeding an award in one jury had a different meaning from an award in another. The rules defining their duties were not sufficiently precise. There were, in reality, no very definite rules on the main points, and the main difficulties of organising the proceedings in each jury were overcome in a different manner by each body of men. A code of laws was, in fact, made by each jury. For example, in some juries it was considered right to give a certain proportion of medals to certain nations, whether the work done were good or bad; others considered it right to give to manufacturers of long standing, who were going in the most ordinary jog-trot, lest the want of a medal should throw them back, but refused to a new and promising idea, because it had not stood the test of time and experience. Of what value is a jury if it must wait to be taught by the time and experience of the public? The jury is intended to be time and experience together. Medals such as were awarded this year express little. There were only two ideas expressed in the rewards—one of moderate, the other of higher proficiency. The medals used did, however, express as many ideas as the jury wished to convey, and are consequently of a proportionate value. The lamentable scarceness of ideas in the rewards (viz., medals and honourable mentions) given made little difference between the best and the worst, so that medals and mentions were in many cases the causes of great injustice. It seemed that the awards of the juries ought to have passed through a second tribunal, as the first was too small to be entirely free from prejudice in all instances. This was expected to be done by the Council of Chairmen. On doing so each jury ought to have been present to explain its own acts and all responsibilities undertaken openly. 6. Decidedly there ought to be a committee for appeals. Arbitrary forms are always to be avoided, and a decision without an appeal is a petty despotism which leads to a great deal of unreasoning presumption. It is a sure mode of fostering corruption, and the idea is in every way unworthy of a country and age in which talent and information are so abundantly found. The appeals would in most cases be rapidly disposed of, and much injustice prevented. 7. The answer is already given. The true mode of bringing inventions before the public is by opinions carefully made and well published. Here as elsewhere it is the amount of mind used in the award which gives it its value. But in addition to this, I think it would be well to reward by a distinct sum of money individuals who make valuable inventions which cannot bring a mercantile reward. This principle is already recognised by the Government, but it is incompletely carried out, and a mode of doing it would require a separate treatise. The sum spent on a few thousand useless medals would make a few substantial prizes. 8. The opinion of many experts meeting without any opposing interests is, in my opinion, so valuable, that many law suits would be saved by them, and many poor men preserved from the ruin caused by the crushing power of capital on invention. At present witnesses are frequently brought together in great numbers to prove or disprove things well known, many very inferior men making assertions which a few well informed could easily set right. Hopes to see a body of men able to give its opinion on inventions, and the time may come when such a body will be the most important in the whole kingdom. Even now a volunteer body could be formed to act for a

great many purposes. Will not draw out the subject further, but wait to see if any attention is to be paid to proposals made.

THOMAS SOPWITH, F.R.S., Juror, Class I.—1. Yes. 2. Has observed through life that prizes of any kind given for merit have a very strong tendency to increase exertion. Medals, or distinctive honourable awards, are usually valued more than money prizes of like value. Such awards are useful marks of excellence which the public can readily recognise, and the hope of obtaining such rewards is a strong motive with many for sending articles to be exhibited. 3. No. 4. The careful selection of well-informed persons as a jury appears to be the most suitable means for arriving at a correct decision as regards comparative merit. 5. It should be imperative on all persons undertaking the office of juror to attend day by day regularly to a careful and systematic inspection of all the articles exhibited in their respective classes; that such attendance be recorded, and that all exhibitors should have an opportunity of personally waiting on the jury, and of inserting in properly tabulated forms such information as the jury might deem requisite. 6. As some cases of inaccuracy, or even of serious hardship, may, through inadvertency or erroneous information, arise, opportunity of appeal should exist. But such a power, unless strictly regulated, might be unsatisfactory. A committee of three, to be called a tribunal of appeal, might be appointed to decide whether reasonable cause of appeal exists, and thereupon, if needful, to take evidence, and confirm, alter, or disallow the award. No such decision to be come to until after a printed statement of the evidence and reasoning for such decision had been submitted to the jurors making such award, and until their observations on a reply to such statement had been considered by the committee or tribunal of appeal. 8. A great quantity of information might be obtained by means of printed forms to be filled in by each exhibitor, the arrangement of such form being adapted to the several classes for objects exhibited. Also the usefulness of the International Exhibition would be greatly increased if clearly printed explanations in detail were affixed to each article exhibited.

Dr. Von STEINBEIS, Director of the Royal Central Board of Industry and Commerce, Stuttgart; Chairman of Jury, Class XXXIB.—1. In order to consider the question whether awards, which have hitherto been given at International Exhibitions, do really answer the purpose intended, it is first of all necessary that we should have a clear understanding of what is the aim of such awards. But neither in the questions of the Society of Arts, nor in the Jury Directory of 1851, nor in that of 1862, is it clearly stated what that aim really is. We read of awards to be given by the juries of International Exhibitions, and we are apprised of the mode of proceeding to be followed, and of the principal points to be kept in view on such an occasion, but nowhere do we find it stated what the final object to be attained by the distribution of awards should be. Even the motto we read on the juror's medal of 1851, "Pulcher et ille labor palmâ decorare laborem," only refers to the business of the juries, without explaining the design of that business. According to the proceedings in 1851, it might be thought that the distributing of prizes was merely to reward exhibitors for their participation in the Exhibition, that is, each one according to the smaller or larger share he had taken in it, some with one medal, others the other; indeed, it so happened that at that time all exhibitors finally got medals, for to those who had not obtained any medals of merit from the juries, "Exhibitors' Medals" were forwarded by her Majesty's Commissioners afterwards. On the present occasion, in 1862, we can scarcely presume that the same object exists, it being notified that amongst seven exhibitors only two are to be selected for medals. But at the same time the Jury Directory recommended that medals should be given to such as would be likely to fulfil one or some of the following conditions or qualifications:—"Novel mode of workmanship, skill and excellence in known methods of workmanship, excellence in the quality obtained combined with utility, instructiveness of any series exhibited, durability, economy in the production, cheapness, economy in maintenance, saving in time and the quantity produced (in the case of machines and implement), application of a new material, good taste, solidity, improvement, new application of known principles, application of new principles, exactness in workmanship, simplicity, perfection, utility, adaptability, increased production, regular productions," &c.; and as there is scarcely any product or fabric to which the one or the other, or even several, of these conditions will not apply, it follows that nearly every exhibitor ought to have a medal; and it is therefore not surprising that dissatisfaction should be caused by the last distribution of prizes. If the aim of the distribution of prizes consists in the rewarding the exhibitors, either for their participation in the exhibition, or for all the qualifications named above, it is clear that the procedure of 1851, where three kinds of medals were given, and each exhibitor got a medal, was preferable to that of 1862 where but one kind of medal was awarded, and the number restricted to one-third the exhibitors. 2. In support of the foregoing opinion, no further evidence will be required; it will, however, lead us to the question:—Whether the rewarding of the mere participation in an International Exhibition would be really a task worthy of such a great enterprise, or of such a body as an international jury? The design of the noble promoters of the International Exhibitions of 1851 and 1862 goes something further than this. They certainly intended to reward merit, which had higher claims than the mere participation in the Exhibition, and also they surely did not mean to give awards for performances which are part of the duties and business of every man who manufactures goods for sale. It would be difficult to find sufficient reason for honouring a manufacturer with a public reward on the ground of his largely supplying the markets with good articles, and of his pursuing successfully his own interests. For these, his sole efforts, he will be rewarded, if they are to the purpose, by his customers. Still it may be said, that by giving to a manufacturer a medal as a reward for his having exhibited a good article, the public is shown the sources where to obtain the good article it wants, and that therefore such an act would benefit the whole community, whilst it would at the same time give support to an active and respectable beginner against large and monopolising firms commanding the markets. But the exhibiting of superior goods of itself gives no guarantee for a regularly good manufacture and supply; the jury cannot even have positive certainty whether the exhibitor has himself manufactured the goods exhibited. It would therefore be quite contrary to the purpose, if we contemplate making the public dispense with its own judgment, which is ready to support the small manufacturer if he produces a cheaper or a better article than others who have hitherto commanded the market, or if, on an increasing demand, he appears on the market at the right time with goods fit to compete in quality and price. General opinion, however, declares that public rewards are in their place in those cases where extraordinary efforts benefiting the whole community have been made. To acknowledge these is as much a demand of gratitude as it is one of prudence. The latter compels us to bring such efforts before the public in order to stimulate others to equal performances, and to set the prospect of an award before those to whom the acknowledgement of their fellow-citizens is of higher value than pecuniary gain, or who have made sacrifices or obtained results, such as cannot be compensated with money. To serve as mediums of public gratitude—as means for the encouraging of progress and stimulating efforts devoted directly to the common wellfare—these are the glorious aims worthy to be inscribed on the statutes of International Exhibitions. But here the greatest precaution is necessary, because the

whole value of rewards given, and thus the very attainment of the aim in question, must depend upon their being given on just grounds, the more so, as they have not for themselves that splendour which is the usual accompaniment of the distinctions which the State bestows, though these are not always given on distinct grounds. On the careful following out these objects depends, too, the only possibility of continuing the holding of International Exhibitions. It is only by strictly admitting in future such articles only as represent real merit—be they inventions or any other works not within the sphere of the every-day work of factories—that the character of the bazaar, as well as the gigantic increase of these exhibitions in extent to which they are tending, so as to render them impossible on economical grounds, can be obviated. 3. If juries, without respect to the quality of the objects which an exhibitor is exhibiting, will only reward such performances as promote art and industry in general, the writer sees no grounds why products of the fine arts should be shut out from the competition. It is difficult to perceive why, for instance, Mr. J. N. Von Fuchs should not have been honoured with a medal for stereochromic wall-paintings, or any other patriotic man, who, after having founded, with considerable sacrifices, a school of art, exhibits some works of that school. The number of such medals would be small indeed, but they would have all the greater value. 4. Cannot propose any kind of juries better adapted to the purpose than those formed in imitation of the juries of the public courts, but it would be necessary that the juries for the awarding of prizes should not content themselves with bearing the name of juries, on the contrary, they should imitate them in their whole organisation and mode of proceeding. Up to the present time juries of international exhibitions have not done justice to their name. They were assemblies of experts, or of commissioners influenced by directions from higher quarters, but not real juries; their deliberations were rather conducted in the way of conversations than of judicial proceedings, and the awards decided upon were more the result of mutual agreement than of regular resolutions, or decisions which would bear the criticisms of the public. 5. Gives the following rules to be observed:—*a*. Only such objects should be admitted to the exhibition, as the exhibitor will certify in writing that he believes represent progress made in certain manufactures within the last ten years. This progress he must clearly define, or point out the excellence relating to art or industry. The document must be attested by the exhibition committee of the place to which the exhibitor belongs. *b*. Applications for space not sent in at least three months before the opening should be refused. Objects, of which no notice has been given, should on no grounds be admitted, except any important discovery, or invention made after the time. Objects not delivered within the time appointed should be refused. *c*. As soon as the time for the applications is over, the objects should be classified, and lists of the goods sent in with the declarations should be published when the time for sending in is past. For their insertion the exhibitor must pay. *d*. The catalogues so compiled should be sold, each class separate, and each exhibitor should have a copy gratis. *e*. Works of recognised merit should have bronze medals:—1. A medal for general merit in relation to art and industry medal for general merit). 2. A medal for the progress made in the manufacture of products of art and industry (medal for progress). 3. Honourable mention upon any praiseworthy efforts in any direction, which have not yet been sufficiently established, or which have not yet attained important results. The designation of "general merit" is bestowed upon every work relating to industry, not bearing the stamp of ordinary efforts for gain's sake, but being of advantage to society at large, or having been proved to exercise a decidedly beneficial influence on the common welfare. As "progress" is to be declared, every improvement of a manufacture, of a tool, of a machine, apparatus, or process for manufacturing, or domestic purposes, be it patented or not, published or not. 6. In order to prepare for, and to assist the labours of the jury, the exhibition commission should appoint a jury commissioner with as many thoroughly experienced jury secretaries, as there are classes of goods. These should be functionaries of the exhibition commission, to be engaged and paid for the whole time the jury is in action. The jury-commissioner in concert with the class-secretaries should direct the arranging of the objects to be exhibited, and the allotting of them to the different classes, receive the letters coming in, forward them to the juries and the reporters concerned, and take charge of the regular transaction of the business of the juries. The jury-secretaries, as soon as the arranging of the objects is to be proceeded with, should forthwith examine each the objects of their classes, so far as this can be done by way of inspection, with all possible speed, and they should record their opinion about them with reference to the published catalogue. These records are subject to the revision of the jury-commissioner, and must contain short statements as to whether, and on what grounds, the exhibitor would deserve the one or the other of the medals, or an honourable mention or not. They must be ready four weeks after the opening of the exhibition at the latest, when they are forthwith to be published as a work of the jury-commission, and delivered for sale. Each exhibitor should receive a copy, and be invited to address to the commission any well-founded appeals. 7. The international jury is to be called together in the usual way, care being taken so that the number of the jurors selected from different countries be not in too great proportion to the number of their exhibitors, and the chairman and deputy chairman should be appointed by the Exhibition Commission as hitherto the case. The number of exhibitors to be allotted to a juror should, in the case of machines, tools, and apparatus, not exceed the number of 50; in the case of other goods, not that of 100, and the number of jurors to be appointed should be in accordance with this rule. Every person accepting the office of chairman, deputy-chairman, or juror, should send in a written document, attested by the competent authority of the country he belongs to, in which he engages to comply with the rules of business for the jury. Every juror should engage to make a report for his jury on certain kinds of articles of his class, for which he is chosen at the selection of the jurors. In this report he should treat of each exhibitor separately, and express strictly his own opinions. For the same purpose, and with the same duties, a proxy may be provided for each juror. Each juror should receive as soon as printed a copy of the published record, compiled by the jury secretary, on the objects of his class, in order that he may study the objects at proper times, and without overhurrying himself, paying regard at the same time to appeals sent in. At the end of two months he should hand his report to the Jury-Commissioner, who will require the president of the jury in each case to call upon his jury to begin its deliberations. The jury to be at liberty to adjourn its deliberations for a further two weeks in order that each juror may have the opportunity of examining the object, in case he has not done so already. Then regular meetings are to be held, in which the merits of each exhibitor and the award to be given are discussed, on the basis of written motions brought forward, with the necessary evidence by the secretary, and revised and remarked upon by the reporting juror. In these meetings, also, appeals sent in should be taken into consideration, and it would be a rule that the reporting juror should have the last word, and the decisions carried by the majority of votes, whilst in the case of equality, the president has a casting vote. The secretary to have the duty of preparing a concise record of the resolutions, to be signed by himself and by the reporting juror, which, after having been attested by the president, will be handed by the latter to the jury-commissioner. These records should be published. According to these records the lists of awards would have to be compiled and published, and the awards distributed

In support of these rules the writer offers the following remarks:—By admitting to the exhibition only works of real excellence, there will be gained, as already stated, this great advantage, viz., that the exhibitions would be rendered less expensive, but all the more interesting. Should it be feared, however, that there might be a want of objects for decoration, nothing would prevent the Exhibition Commission allotting to each division, that is to say, to each country or province, a certain amount of additional space for such objects, which would, however, not have any claims upon the examination of the jury, and should be described in a special division of the catalogue. The fact that the document which each exhibitor is to send in must be attested by the Local Committee, would of itself prevent the exhibiting of unqualified products. The insisting upon the strict observance of the time of delivery would ensure a speedy delivery, a matter of the utmost consequence for the timely and regular transaction of the business of the jury. The publishing of the applications would have a double advantage. In the first place, it would be the means of providing the visitors with a very interesting exhibition-catalogue, which, being much more to the purpose would attract a greater number of visitors than the one hitherto in use, without, however, excluding eventually the publishing such a one. In the second place it would bring everything before the public, and under the criti ism of the competitors, and thus prevent or punish every kind of manifest humbug. The obligation of the exhibitor to pay for his insertions would guard against any abuse. The making a distinction between "general merits for industry" and "progress," has been borrowed from 1851. By this means occasion would be afforded for the pointing out any sacrifices made for the general welfare over efforts having mere self-interest for their motive. By it besides, a certain gradation is given, exciting a contest for the reaching of the higher degree. The drawing these lines of demarcation presents no difficulty. The appointing of a Jury Commissioner for the whole of the juries, and of a Secretary for each jury, is not a new provision; it contains, however, the new feature, that the commissioner appoints to each secretary the exhibitors to be under his charge, whereby the passing over of the one or the other of the exhibitors, which did so frequently happen, will be guarded against. Another and very important new regulation is the obligation of the secretaries to lay before the assembled juries records minutely describing and reviewing a whole class. By these preparatory works the business would be brought to assume, as it were, the order and regularity of the judicial proceedings of a public court; and by the publishing and forwarding of these records to the exhibitors, any partiality would be obviated, whilst at the same time any exhibitors who may think they have been treated unfairly, would have an opportunity of collecting evidence to bear upon their own interests. For the facilitating and despatching of the labours of the juries, another effective means would be found in the circumstance that the jury-secretaries can begin with the preparing of their records during the unpacking of the goods, so that they may have them finished for the most part on the day of the opening of the exhibition. Moreover, if it be arranged that each exhibitor gives notice to the jury-secretary of his beginning to unpack, the latter will have a very good opportunity for a minute examination of the objects, and for the collecting information from the exhibitor, or his agent; whilst those of the exhibitors, who are desirous of personally giving explanations, would save time and money. The appointment of a deputy chairman by the exhibition-commission recommends itself by the consideration that it is of great importance to find thoroughly qualified persons for directing the labours of the jury, as well as to provide the jurors, who are for the most part professional men, with assistants of good general education, for which reason their appointment should not be left to the chance of an election. Nor can it be recommended that the president of the jury should act at the same time as reporter, for he should guide the deliberations in an independent manner. The defining the number of jurors according to the number of exhibitors is necessary in order to insure the timely despatch of the labours of the juries; and the same is to be said of the providing for a proxy, if any of the functionaries should be absent. All the members of the juries joining in the duties of reporting, would render this duty easier for any single member, preventing at the same time any persons from joining the jury who have no knowledge, or not sufficient knowledge, or who do not like to work. This provision, therefore, offers an essential guarantee for a fair judgment, and by procuring, as it were, for each exhibitor an advocate, it, at the same time, gives to these juries an organisation similar to that of the public courts. The juries, acting on the written documents and the subsequent examinations and explanations, would thus come to decisions which can scarcely be far wrong, seeing that not only the parties concerned, but also the public at large, have had an opportunity for pronouncing their opinions, a condition by which the publicity of a real judicial procee ding is realised as far as possible. The final resolutions, too, would be more speedily arrived at, inasmuch as it may be assumed that the secretary will agree in most cases with the reporter, but if not, then the decision of the united jury will be all the more required. By the publication of the minutes, the whole of the proceedings of the juries would be finally brought to the test of publicity, and as the reasons of the reporters are to be recorded side by side with the resolutions, the responsibility of the latter, as well as that of the president and of the whole jury, would afford to the public a sufficient guarantee for the justness of the decisions, such as hitherto never has been given. The particulars put together, as a whole, would form a historical work, affording instruction to the manufacturer and merchant, as well as to the technologist, the political economist, and the politician; it would take down to posterity the essence of International Exhibitions, and render a service to history which cannot be too highly appreciated. The only objection which may perhaps be made against this proposal will be the difficulty of obtaining men thoroughly qualified for the task in question without the spending of considerable sums of money. But this ought not to be a serious objection in the case of an International Exhibition, which would certainly always pay its expenses if kept within the limits defined in the foregoing remarks. No doubt there must be then no highly decorative and very expensive buildings. On the contrary, the beauty of the Exhibition would have to be sought in the tasteful arrangement and building up of the objects to be exhibited, rather than in architectural constructions and ornamentations which are apt to seduce the eye of the visitor, and to turn it away from the articles exhibited, instead of giving it relief. 6. With arrangements such as have been proposed in the foregoing, a Court of Appeal would seem to me perfectly surperfluous, and equally so the Council of Chairmen hitherto in existence, which, indeed, was only intended to interfere with the decisions of the juries, which were, at any rate, far more to the point than those of the Council, and thus to deprive the juries of one of their most essential qualifications, namely, of the final validity of their decisions. 7. It has been proposed by some, that instead of awarding prizes, the whole matter might simply be given over to the opinion of the public, or the press, or, if jurors should be appointed at all, that their whole business should be confined to their preparing a report. But neither the exhibitors nor the public would be benefited by either of these propositions. The public, which generally has not sufficient leisure to examine the Exhibition article by article will no doubt be desirous to be assisted in its judgment. A fair impartial judgment of the press is not always to be looked for, and if, after all, a jury has to pronounce its opinion, there are no just grounds why that opinion should not find summary expression in the award of

medals, which, as experience has shown, will really be of great advantage to many exhibitors. 8. Such are in a few outlines the views the writer brings forward in answer to the questions put by the Society of Arts. They are by no means the result of mere abstract reasoning, but rather of a long and ample experience, and they have been verified for the most part by practice. Having had the honour of being charged, at the International Exhibition of 1851, with the duties of a juror and reporter for the "Zollverein," in Class XXII (hardware); in 1854, at the (German-Austrian) General Exhibition, in Munich, with those of chairman and reporter for class X (furniture, fancy-ware, and domestic implements); in 1855, with those of chairman, for class XVI (hardware), and reporter for the "Zollverein," and lastly, in 1862, with those of chairman for class XXXI, and on all these occasions with the additional duties of an exhibition commissioner for the government of Württemburg, the writer has had opportunities of collecting ample experience on the question of the award of prizes. As president of a board, which has amongst its duties the encouragement of the industry of the country by local exhibitions, the writer has promoted and directed in Württemburg a number of such exhibitions with and without awards, and, assisted by other experienced and competent men, has been enabled to bring to bear upon them the experience obtained from the Great Exhibitions of 1851, 1854, and 1855. But having convinced himself already on the occasion of the latter that the mode of proceeding adopted there was doing no good, he took pains to organise the distribution of prizes he had introduced, so as to remove the imperfections under which exhibitions had hitherto been suffering, and to make the latter, as well as the awards, what they really should be, a public exposition of the development of industry for the time being, and a recognition of the merits of those who had distinguished themselves. A small exhibition of the industrial products of Württemburg, held in 1858, and organised after the described system, was a perfect success, and as to the distribution of prizes, which then took place, the writer is prepared to guarantee that no undeserving work has been rewarded, and no real merit has been passed over. As regards the amount of time and labour employed, he states that there was rather less with the system recommended by him than with the old one, applied to an exhibition of equal magnitude.

(*To be continued.*)

## Home Correspondence.

### MR. ISBISTER'S PAPER ON A PROPOSED PENAL SETTLEMENT.

SIR,—The question referred to by Mr. Isbister in his paper read on Wednesday evening, the 21st inst., is one of such vast general importance, and, moreover, possesses such peculiar interest at the present moment, that I hope I may be excused for troubling you with a few lines upon it. I am not acquainted with the territory the suitability of which to the purpose of a penal settlement it was one of Mr. Isbister's objects to point out, and I will not touch upon those portions of the paper in which he gives so interesting and graphic a description of that apparently inhospitable region, but I will confine myself to the consideration of whether a return to the old system of transportation would (with some modifications) be really a measure likely to contribute in the first place to the peace and safety of society in general, and in the second place to the reformation, whenever practicable, of the criminal himself.

Regarding, as I do, the first consideration as the one which really ought to guide us in coming to a conclusion, I cannot but be impressed with the advantages which transportation appears to offer for this object. Although it is probably true that public opinion in the present day would revolt against any extension of the punishment of death, there are some who would venture to recommend even this—not so much on the preventive principle, which in former days led us to inflict it for such crimes as horse-stealing and forgery, these being supposed to be very easily committed, and therefore to require that specially severe penalties should be attached to them—but with the simple view of ridding society of those of its members who had proved by their crimes that they were dangerous to it, and who had also entirely forfeited all right to its protection. With the advocates of this view, however, I cannot agree, for many reasons, which it would occupy too much of your space to enter into, and my only object in referring to it is that I cordially agree with the remark made by Sir Thomas Phillips at the conclusion of the meeting, that if secondary punishments cannot be rendered really effectual, it is much to be feared that a reaction will take place in the public mind, and that a feeling in favour of returning to some of the severities of our old criminal code will arise.

If, then, the punishment of death is excluded from consideration, what substitute appears to fulfil most nearly the conditions just referred to? If the criminal cannot be deprived of his life, and thus sent out of the world, the next best plan seems to be to send him far away from those whom his crimes might injure, and to force him to herd only with criminals like himself. The carrying this out with every gradation of severity seems possible only in the system of transportation. It may perhaps be just as important that society should be protected from the systematic swindler and forger as from the murderer and garotter, but it would surely be unjust and impolitic to expose them to punishments of exactly the same character, and to shut out from the former, as must unhappily be generally done from the latter, all hope of restoration. Society, however, may by means of transportation, carried out in different forms, be happily rid of both. The first may be punished by being forced to inhabit a bleak, inhospitable country, separated, at least for a time, from his family, compelled to a certain amount of manual labour, but with hopes held out to him that by his long-continued good conduct, he may ultimately be allowed comparative liberty. The perpetrator of crimes of violence may, on the other hand, be exposed to every hardship, compelled to labour in a painful and degrading manner, unprotected from the rigours of a severe climate; and his life, justly forfeited to society, but spared by the humanity of our modern laws, may thus be worn out in misery and degradation.

I cannot but think that the broad distinction with regard to punishment that ought to be drawn between crimes of violence and cruelty and offences which, however injurious to society, may be committed by men whose moral nature is not utterly degraded, and who are, in many cases, capable of reformation, has not been sufficiently insisted upon. Judges pronounce the sentence of "penal servitude" alike on the cruel and reckless garotter and the dishonest banker; and confusion is thus produced in the public mind as to the relative enormity of their offences. I am not attempting to palliate the guilt of the man whose dishonest dealings have perhaps inflicted ruin upon hundreds; let his crimes be visited with a severe and well-merited chastisement, but we know that in such cases the criminal is often capable of reformation, that he may see the error of his ways, and become again fit for the society of his fellow men; but what hope can there be for the wretch who for some paltry plunder will wantonly inflict injury, perhaps worse than death, on a man who never injured him? Should any mercy be shown to such crimes as these? Can we fairly hope that in any number of cases there is the slightest hope of reformation? Surely not; and if so, our duty is to take the easiest and most economical means of ridding society of the criminal, and placing him in a situation where he will feel that he has no longer that legal protection to which he has forfeited his right, and where he will be far removed from, and consequently unable to injure, his fellow men.

This brings me to the objections so ably urged in the course of the discussion, more particularly by Mr. Hawes, against the system of transportation, That gentleman argued that we had no right to throw into our colonies the refuse population of the mother country; but in the plan advocated by Mr. Isbister, this is not contemplated. It is intended to devote a peculiarly inhospitable portion of our possessions abroad—a country offering little temptation to the free emigrant—to the founding of a regular penal colony, and though, doubtless, the race would be deteriorated, and the descendants of the convicts would not be either physically or morally so elevated a class as the ordinary type of Englishmen, still, on the other hand, it is well known that the sons and grandsons of convicts are now occupying honourable positions in our colonies, and even in this country, fulfilling their duties to society, and redeeming the errors of their fathers. We certainly ought not to force our reluctant colonies to receive convicts; no one would now be so rash as to attempt this; but if a territory can be found where a regular penal settlement can safely be created, it seems evident that a discharged convict would (when the colony was somewhat advanced) have a much better chance of obtaining honest employment in a country, where labour would be scarce, than in the midst of a crowded population, where, moreover, the prejudices against the employment of such persons are already strong, and are every day becoming stronger. If Mr. Isbister's description of the Hudson's Bay territories is a correct one, it is surely worthy of grave consideration, whether this at present useless portion of the earth might not be thus made available as a receptacle for criminals, and an English Siberia created where, happily, there is no fear of our sending political criminals, for we have none, but where the outcasts of society might be forced to labour for their own subsistence, without being able to prey upon their fellow men as they now do when in possession of that convenient passport to crime, the "Ticket of Leave."

I am, &c.,

G. F.

## MEETINGS FOR THE ENSUING WEEK.

MON. ...Entomological, 7.
Medical, 8½. Clinical. 1. Dr. Cockle, "On the Conditions of the Aorta simulating Aortic Insufficiency." 2. Mr. Streeter, "Disease of the Brain by Extension from the Ear." 3. Dr. Greenhalgh, "New Metrotome." 4 Dr. Richardson, "Nitrate of Amyle." Communications from Drs. Gibbs and Thudichum, Messrs. Baker, Brown, and others.
Royal United Service Inst., 8½. Commander Frederick Warren, R.N., "Bow Rudder as proposed by him."
Royal Inst., 2. General Monthly Meeting.

TUES. ...Civil Engineers, 8. Mr. Bryce McMaster, "On the Sleeper Woods of the Madras Railway."
Pathological, 8.
Photographic, 8. Annual Meeting.
Ethnological, 8. Mr. Dunn, "Some Observations on the Psychological Differences which exist among the Typical Races of Man."
Royal Inst., 3. Prof. Marshall, "On Animal Mechanics."

WED. ...Society of Arts, 8. Mr. Alexander Burrell, "On Cooking Depots for the Working Classes recently established in Glasgow and Manchester."
Geological, 8.
Pharmaceutical, 8.

THURS...Royal, 8½.
Antiquaries, 8½.
Linnæan, 8. Mr. Charles Darwin, M.A., "On the Existence of Two Forms, and on their Reciprocal Sexual Relation, in several Species of the genus *Linum*."
Chemical, 8.
R. Society Club, 6.
Royal Inst., 3. Dr. E. Frankland, "On Chemical Affinity."

FRI. .....Royal Inst., 8. Mr. James Glaisher, "On Aerial Scientific Research."
Philological, 8.
Archæological Inst., 4.

SAT. .....Royal Inst., 3. Mr. W. S. Savory, F.R.S., "On Life and Death."

## PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, January 23rd*, 1863.]

*Dated 21st November*, 1862.

3133. C. Wagner, Liverpool—Imp. in strengthening, securing, and rendering more durable the soles or bottoms of boots, shoes, and other coverings for the feet. (A com.)

*Dated 26th November*, 1862.

3174. J. R. Danks, B. P. Walker, and R. P. Walker, Wolverhampton—Imp. in machinery or apparatus for making boot and shoe heel and toe tips, clog irons, and other similar articles.

*Dated 27th November*, 1862.

3181. D. Auld and D. Auld, jun., Glasgow—Imp. in working furnaces and steam boilers, and in apparatus connected therewith.

*Dated 8th December*, 1862.

3292. E. T. Hughes, 123, Chancery-lane—Imp. in galvanic apparatus. (A com.)

*Dated 16th December*, 1862.

3358. J. J. Lemon, 10, New Compton-street, Soho—Imp. in book trays or holders.

*Dated 19th December*, 1862.

3399. D. Davidson, Woodcroft, Morningside, near Edinburgh—Imp. in the construction of telescopes, and in the method of arranging and fixing the same in combination with fire-arms for the purpose of adjusting the aim thereof.

3401. J. Dalton, Brooklyn, New York—Imp. in knitting machinery.

*Dated 26th December*, 1862.

3455. J. Swainson, jun., Newton Stewart, Wigton, N.B.—Imp. in the manufacture of pill boxes and similar boxes from solid wood, and in machinery to be employed in the said manufacture.

*Dated 29th December*, 1862.

3464. A. W. Sleigh, 73, Harley-street, Cavendish-square—An improved method of rendering or making ships and vessels, and floating and shore batteries, or ambulent or stationary defences impenetrable to shot and shell, and to other missiles and projectiles, and war rams.

*Dated 31st December*, 1862.

3481. B. Bottomley, Rochdale—Imp. in machinery for twisting and doubling yarns or threads of cotton and other fibrous materials.

3485. J. W. P. Field, 233, High Holborn—Imp. in breech-loading fire-arms.

3487. J. M. Napier, York-road, Lambeth—Imp. in heating apparatus.

*Dated 1st January*, 1863.

1. R. H. Collyer, Beta-house, 8, Alpha-road, Regent's-park—Imp. in the method of, and apparatus for, preparing materials for the manufacture of paper and similar purposes, part of which invention being also applicable to other operations in which materials are subjected to the action of hot agents.

3. G. Allcroft, New Church-row, Camberwell—Imp. in pressure gauges and vacuum gauges.

5. J. T. Smith, Lee, Kent—Imp. in obtaining motive power from steam and the products of combustion.

7. J. J. Southgate, Kensington—Improved arrangements for portable fire escapes.

9. W. Soutter, Birmingham—Certain apparatus for raising and planishing metals.

11. J. E. Baker, Cheapside, and J. Landon, Crosskey-square, Little Britain—Imp. in the construction of boots, shoes, and other coverings for the feet.

*Dated 2nd January*, 1863.

13. F. C. Bakewell, 6, Haverstock-terrace, Hampstead—Imp. in apparatus for burning oils and other inflammable fluids as fuel. (A com.)

15. H. Lyon, 31, Sydney-street, Commercial-road—Imp. in the finish and mode of packing cigars, and in apparatus used for these purposes.

17. E. T. Hughes, 123, Chancery-lane—Imp. in producing designs upon velvets, cloth, furniture hangings, and similar materials. (A com.)

19. H. J. Sergeant, Manchester—Certain imp. in the method of dressing and finishing silk fabrics and fabrics composed of silk, cotton, and wool.

*Dated 3rd January*, 1863.

23. H. Jones, Manchester—Certain imp. in steam engines.

25. W. Phillippi, Stromberg, Prussia—Imp. in the manufacture of bearings and axle boxes for machinery, carriages, and railway rolling stock.

27. W. Astrop, Jubilee street, Stepney—Imp. in the manufacture of paper.

28. C. B. Clough, Lewyn Offa, Mold, Flintshire—Imp. in apparatus for curing smoky chimneys.

29. W. T. Smallware and C. B. Weaver, Fazeley, Staffordshire—Certain imp. in treating or covering strip steel or other suitable material for the making of crinoline skirts and other similar purposes for which the same may be applicable, and which same treatment or covering may be used for trimming or strengthening certain parts of ladies' dresses.

*Dated 5th January*, 1863.

31. E. B. Keeling, Gray's-inn—An imp. in lighting halls, theatres, and other buildings.
33. J. A. Cooper, Trowbridge, Wiltshire—The application of a fibre obtained from a certain plant as a substitute or to be used with silk, cotton, flax, and such like materials, which fibre has not hitherto been applied to any of those purposes, and for certain methods of preparing the same for such purposes.
35. H. Blacktin, Bradford—Imp. in means or apparatus for saving or preserving money, papers, or other valuable property at sea in case of shipwreck. (A com.)
37. H. Bessemer, Queen-street-place, New Cannon-street—Imp. in the construction and mode of working apparatus to be employed in pressing, moulding, shaping, embossing, crushing, shearing, and cutting metallic and other substances.
39. D. Nevin and W. Coppin, Londonderry—Imp. in machinery for clearing and separating the woody parts from the fibrous portion of flax, hemp, or other like material.

*Dated 6th January*, 1863.

40. J. A. Munn and J. D. Cobb, 8, Gresham-street—Imp. in automatic walking dolls and other figures. (A com.)
41. W. E. Newton, 66, Chancery-lane—Imp. in magneto-electric telegraphs. (A com.)
44. J. Leigh, Manchester—Imp. in the treatment of gas produced by the distillation of coal, cannel, bituminous shale, boghead, mineral oils, petroleum, or other combustible substances, and for the obtaining of certain products therefrom.
45. T. Vicars, sen., T. Vicars, jun., and T. Ashmore, Liverpool—Imp. in machinery for manufacturing bread, biscuits, and other like articles.
46. J. A. Knight, 4, Symond's-inn, Chancery-lane—Imp. in printing presses. (A com.)
47. M. Hodgart, Paisley—Imp. in presses for pressing cotton and other substances. (A com.)
49. J. G. Dahlke, Battersea—Imp. in machinery for cutting clay in the manufacture of bricks, tiles, and similar articles. (A com.)
50. G. Turner, Campbell-square, Northampton—A new method of making leather from waste pieces of common leather.
51. J. Whitworth and W. W. Hulse, Manchester—Imp. in ordnance.

*Dated 7th January*, 1863.

53. J. Neale, 11, King's-road, Ball's-pond—Imp. in the manufacture of capsules. (A com.)
54. T. F. Cashin, Sheffield—Imp. in covering wire, crinoline steel, or hoops for skirts.
55. W. Crabtree and J. Crowther, Newton-green, near Todmorden, Yorkshire—An improved mode of perching and dressing textile fabrics during the process of weaving.
56. W. S. Bruce, Great St. Helen's, Bishopsgate-street—Imp. in lucifer matches, fusees, and other similar lights, and in the boxes or holders for containing the same. (A com.)
59. G. C. Grimes, 8, Wandle-terrace, South-street, Wandsworth—Imp. in means or apparatus for treating splints used in the manufacture of matches, and other lights.
63. G. T. Bousfield, Loughborough-park, Brixton—Imp. in skate fasteners. (A com.)
64. H. Harben, Oxford-villa, Haverstock-hill—Imp. in the manufacture of fibrous material for cleansing machinery and other purposes.
65. J. H. Johnson, 47, Lincoln's-inn-fields—Imp. in the permanent way of railways. (A com.)

*Dated 8th January*, 1863.

70. R. T. Monteith, St. Malo, France, and R. Monteith, 64, Crystal-terrace, Cecil-street, Greenheys, Manchester—Imp. in the manufacture of dyes from aniline and its analogues. (A com.)

*Dated 9th January*, 1863.

74. R. Thomas, 70, Berners-street, Oxford-street—Imp. in apparatus for rendering hair "wavy."
78. D. B. Parsons, 77, Upper Thames-street—Imp. in reaping and mowing machines. (Partly a com.)
80. D. Collinge, Oldham—Imp. in machinery or apparatus for cleaning and preparing cotton or other fibrous materials to be spun.
82. G. B. Price, Bedford—Imp. in sights for fire-arms.
84. M. Henry, 84, Fleet-street—Imp. in furnaces. (A com.)

*Dated 10th January*, 1863.

86. W. Grove, Tenbury, Worcestershire—Imp. in apparatus for sawing wood and other substances.
88. M. Vogl, Sambrook-court, Basinghall-street—An improved fastening for bags and other articles.

*Dated 12th January*, 1863.

92. D. Dawson, Huddersfield—Imp. in manufacturing "Magenta" colour or dye.
94. E. Stevens, 139, Cheapside—Imp. in ovens, hot plates, and cooking apparatus.
96. W. Clark, 53, Chancery-lane—Imp. in carding engines. (A com.)

*Dated 13th January*, 1863.

100. T. G. Lewis, Cumberland-place, Newington Butts—Imp. in apparatus applied to perambulators, invalid chairs, and other carriages.
104. W. Platts and J. Bailey, Manchester—Certain imp. in telegraphic cables.
106. C. H. Townsend and J. Young, Bristol—Improved composition for preventing incrustation and corrosion in steam boilers and condensers.
110. C. E. Amos, The Grove, Southwark—Imp. in machinery for the manufacture of paper.
112. T. Butler, Nottingham—Imp. in the manufacture of lace in twist lace machines.
114. H. Bessemer, Queen-street-place, Cannon-street—Imp. in the manufacture and treatment of malleable iron and steel, and in furnaces, machinery, and apparatus employed in such manufacture.

*Dated 14th January*, 1863.

118. J. S. Butler, St. Alban's-terrace, Nottingham—Imp. in the manufacture of bobbin net made on bobbin net or twist lace machines.
120. G. A. Biddell, Ipswich—Imp. in machines for pulping turnips and other vegetable substances.
122. J. Lawson, Hope Foundry, Leeds—Imp. in apparatus for holding castings and other pieces whilst being planed or shaped.
124. G. Holt, 5, Canterbury-place, Lambeth-road—Imp. in apparatus for sweeping or cleaning chimneys, and also in apparatus for preventing chimneys from smoking.

*Dated 15th January*, 1862.

128. W. Hulse and C. L. Haines, Birmingham—Imp. in machinery for the manufacture of taper metallic tubes.
130. T. C. Barraclough, Manchester—Imp. in apparatus for cutting metallic tubes or pipes, or tubes or pipes composed of other indurate substances. (A com.)
136. C. Murrell, Pinfold-street, Aylsham, Norfolk—Imp. in breech-loading fire-arms.
140. A. Prince, 4, Trafalgar-square, Charing-cross—Imp. in sewing machines.

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INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

119. G. T. Bousfield, Loughborough-park, Brixton—Imp. in machinery for rolling, grinding, and cutting files. (A com.)—14th January, 1863.
155. G. T. Bousfield, Loughborough-park, Brixton—Imp. in hot-air engines. (A com.)—17th January, 1863.

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PATENTS SEALED.

[*From Gazette, January 23rd*, 1863.]

*January 21st.*

2083. R. Grogan.
2099. R. Bell.
2100. J. Leetch and B. Mathew.
2103. W. Clissold.
2106. J. G. Clarke.
2107. W. H. Perkin.
2110. H. A. Jowett.
2111. J. Redgate and H. Redgate.
2112. J. Anderson.
2113. P. Robertson.
2114. W. Clark.
2124. J. H. Selwyn.
2127. J. Walton and J. Moore.
2128. H. Bollinger.
2135. T. Cook.
2136. A. Noble.
2160. B. Bailey.
2223. N. J. Amies.
2239. W. E. Newton.
2243. N. J. Amies.
2278. J. H. Johnson.
2286. G. White, F. Buckland, and C. Rees.
2349. D. Moore.
2351. D. Moore.
2358. M. Henry.
2382. A. V. Newton.
2756. C. Thomas.
2928. G. Mayall, jun., and J. Hollingworth.
3160. E. Wadsworth.
3198. W. E. Gedge.

*January 23rd.*

2130. W. Spence.
2132. W. Spence.
2133. T. A. Favrichon.
2134. W. Maugham.
2337. J. Fourdrinier.
2139. F. Selby.
2140. H. Hedgely.
2141. E. Burnett.
2148. E. T. Hughes.
2150. J. Norris.
2151. C. T. Burgess.
2164. G. H. Birkbeck.
2170. E. F. Prentiss and R. A. Robertson.

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PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

[*From Gazette, January 27th*, 1863.]

*January 19th.*

155. J. F. Belleville.

*January 20th.*

158. O. Vivier.
185. F. Yates.
190. F. G. Grice.
221. T. Dunn.
277. W. H. Tooth.

*January 21st.*

153. C. P. P. Laurens.
201. P. Effertz.
280. A. Watkins.

*January 22nd.*

165. M. Rae.
172. C. C. J. Guffroy.
209. F. Walton.

*January 23rd.*

166. J. Potter.
257. W. Hartley.

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PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

[*From Gazette, January 27th*, 1863.]

*January 19th.*

163. J. B. P. A. Thierry, jun., J. L. Richard, and Baron H. de Martiny.
171. J. Francis.

*January 20th.*

313. J. Howard.

*January 22nd.*

218. W. Beasley.

*January 23rd.*

197. F. Chauchard.